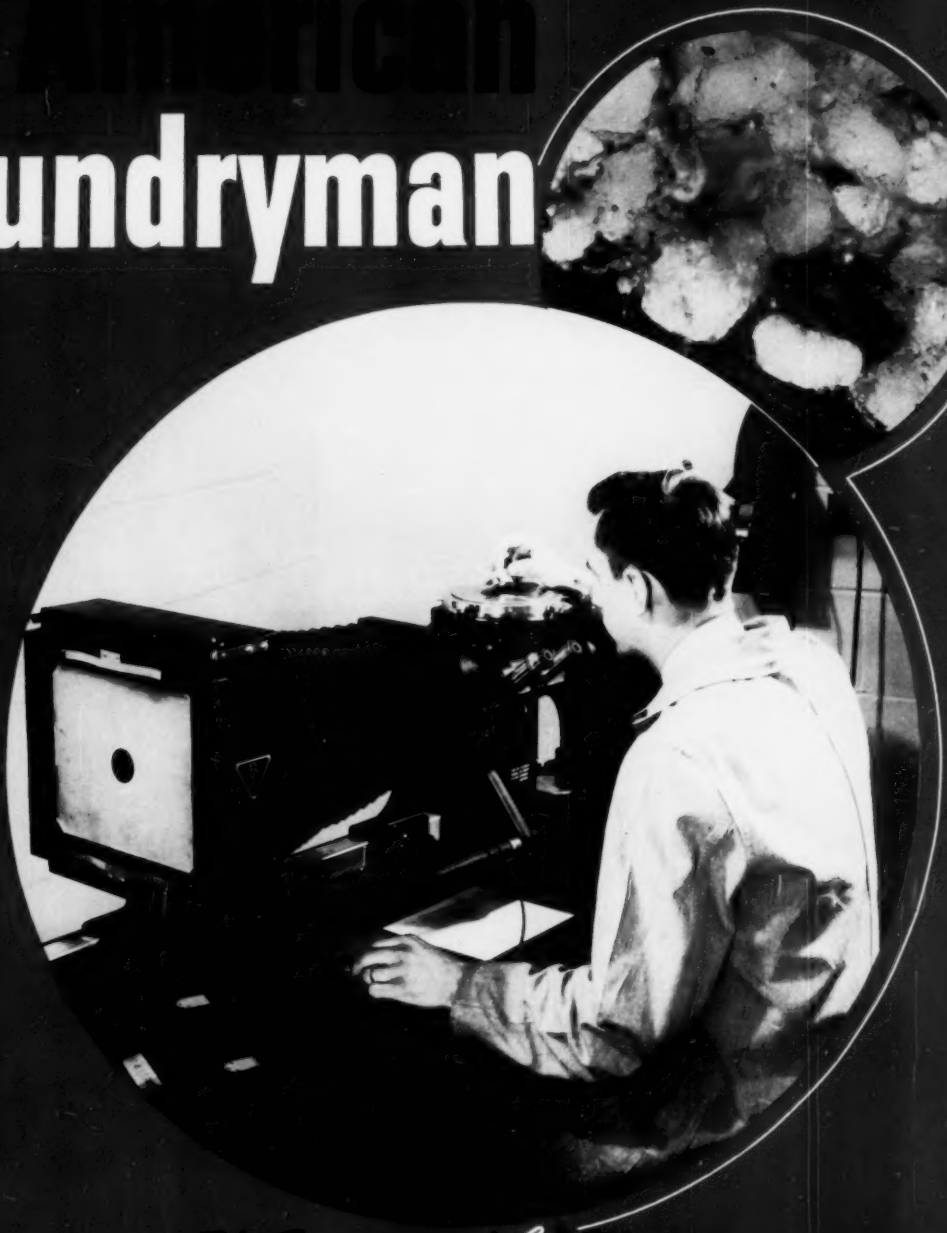
American Foundryman



The Foundrymen's OWN Magazine · August 1950

...the RESPONSIBILITY that's delivered with your Lectromelt furnace

SINCE 1940
Roy C. Squires

SINCE 1926
Charles W. Baltzer, Jr.

SINCE 1929
John Muszynski

Moore, inventor of the Rapid Lectromelt Furnace, inaugurated the plan many years ago. Engineers, skilled in applying electric arc furnaces to melting, refining, smelting and reduction, were sent into the field. Their assignment, to help Lectromelt Furnace users get into production most expeditiously and economically.

Lectromelt's field engineers, shown here, are known to plant operators everywhere. Talk to an electric furnace man and he'll cite cases of where and how our roving representatives have helped them.

Lectromelt Furnaces offer you rapid top-charging, high-speed melting, accurate control of quality, low-cost operation. Lectromelt field engineers help you keep abreast of the latest developments in the use of your furnace.

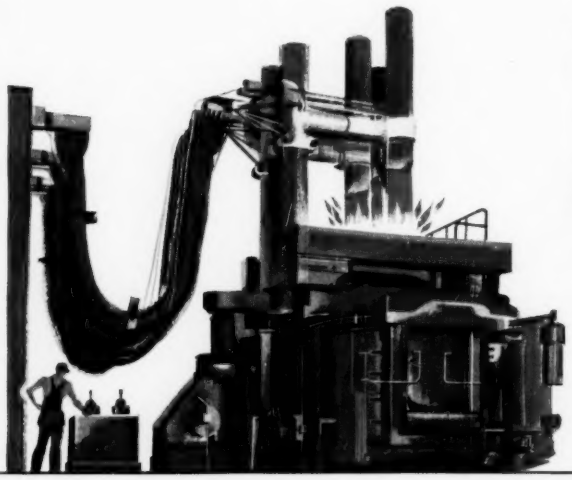
For further data, write for Bulletin No. 7. Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in... CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2... ENGLAND: Birlec, Ltd., Birmingham... SWEDEN: Birlec, Elektkougnar A/B, Stockholm... AUSTRALIA: Birlec, Ltd., Sydney... FRANCE: Stein et Roubaix, Paris... BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege... SPAIN: General Electricc Espanola, Bilbao... ITALY: Forni Stein, Genoa.

SINCE 1922
Frank I. Durie

SINCE 1923
Joseph Charnock

SINCE 1942
A. Ospina Racines



WHEN YOU MELT... MOORE RAPID *Lectromelt*

A GOOD PRODUCT SPEAKS FOR ITSELF

Federal Green Bond

SAYS:

"I CONTROL SAND STRENGTH. I CAN MAKE SAND FIRM AND STABLE, OR I CAN MAKE IT SO IT COLLAPSES READILY. I NEVER VARY IN PERFORMANCE OR QUALITY. I AM ALWAYS DEPENDABLE. I AM THE BEST WYOMING BENTONITE."

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Seacoal Plant
CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • NEW YORK • ST. LOUIS • RICHMOND, VA. • UPTON, WYO.
Mines

IN TWIN CITIES: Wisner and Company, Commerce Station Box 71, Minneapolis 15, Minn.

how PURITE assures Cleaner Iron Better Castings

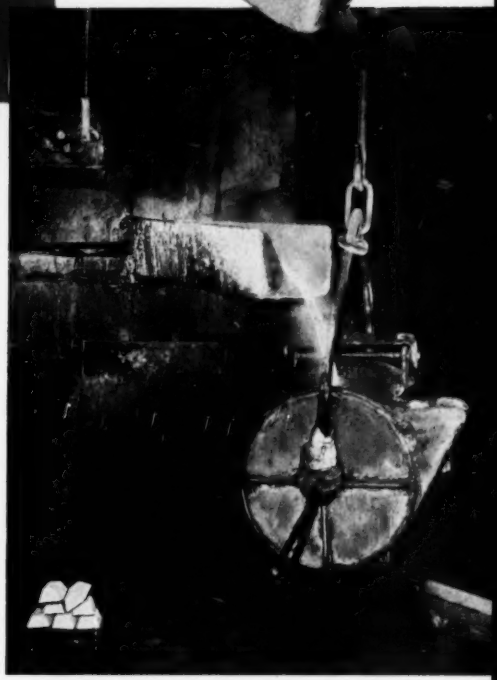
PURITE 100% FUSED SODA ASH

The Scientific Flux for Better Melting and Cleaner Iron

Purite is a country-wide foundry favorite. This broad acceptance is based on proven performance in producing better castings. Here are the reasons why Purite is first choice in foundry after leading foundry:

1. **Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.**
2. **Purite gets to the iron faster—no quicker desulphurizer made.**
3. **Purite is time-tested and proven for unsurpassed desulphurizing uniformity.**
4. **Purite comes in 2 lb. pigs—no weighing or measuring required.**
5. **Purite is 100% pure fused soda ash—you do not pay for inert materials.**
6. **Purite does not crumble—no waste—no dust.**
7. **Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.**

For nearly 30 years there's been no substitute for this successful product. Confirm Purite's many advantages by an actual trial in your own cupolas and ladles. If you need further information, please write today to: Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.



Tapping a modern cupola at the foundry of Mack Trucks, Inc., at New Brunswick, N. J.

Mathieson CHEMICALS

Purite is sold by all leading foundry supply houses in the United States and Canada.

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

A. F. S.

NATIONAL OFFICERS

PRESIDENT
*Walton L. Woody
National Malleable & Steel Castings Co.
Cleveland

VICE-PRESIDENT
*Walter L. Seelbach
Superior Foundry, Inc.
Cleveland

NATIONAL DIRECTORS

Term Expires 1951

T. H. Benners, Jr.
T. H. Benners & Co.
Birmingham, Ala.

*N. J. Dunbeck
Eastern Clay Products, Inc.
Jackson, Ohio

Robert Gregg
Reliance Regulator Div.
American Meter Co.
Alhambra, Calif.

*E. W. Horlebein
Gibson & Kirk Co., Baltimore, Md.

Martin J. O'Brien, Jr.
Symington-Gould Corp.
Depew, N. Y.

*V. E. Zang
Unicast Corp.
Toledo, Ohio

Term Expires 1952

T. E. Eagan
Cooper-Bessemer Corp.
Grove City, Pa.

L. C. Farquhar, Sr.
American Steel Foundries
East St. Louis, Ill.

V. J. Sedlon
Master Pattern Co., Cleveland

*F. G. Sefing
International Nickel Co., New York

L. D. Wright
U. S. Radiator Co., Geneva, N. Y.

Term Expires 1953

J. J. McFadyen
Galt Malleable Iron Co.
Galt, Ont., Canada

J. O. Ostergren
Lakey Foundry & Machine Co.
Muskegon, Mich.

Frank W. Shipley
Caterpillar Tractor Co.
Peoria, Ill.

James Thomson
Continental Foundry & Machine Co.
East Chicago, Ind.

E. C. Troy
Palmyra, N. J.

*Member Executive Committee

PUBLICATIONS COMMITTEE

H. M. St. John, *Chairman*
Crane Co., Chicago

C. H. Lorig
Battelle Memorial Institute
Columbus, Ohio

W. D. McMillan
International Harvester Co., Chicago

H. J. Rowe
Aluminum Company of America
Pittsburgh

F. J. Walls
International Nickel Co., Detroit

A.F.S. HEADQUARTERS
616 S. MICHIGAN AVE.
CHICAGO 5, ILL.

Wm. W. Maloney, *Secretary-Treasurer*
S. C. Massari, *Technical Director*
Jos. E. Foster, *Technical*
A. A. Hilbron, *Convention & Exhibits*
H. F. Scobie, *Editor*
R. N. Sheets, *Assistant Editor*
C. R. McNeill, *Editorial*
Terry Koeller, *Advertising & Promotion*

AUGUST, 1950

VOLUME XVIII, NUMBER 2

American Foundryman

August, 1950

Official publication of American Foundrymen's Society

Editorial: Foreign Foundry Developments Merit Attention: Gosta Vennerholm

A.F.S. Board of Directors Holds Annual Meeting

Dies for a Malleable Production Foundry: K. L. Sanders

Copper Electrodeposition for Aluminum Alloys Containing Tin and Antimony: George Norwitz

Increased Activity Marks 1950 A.F.S. Apprentice Contest—Analysis of Entries: R. W. Schroeder

Develop Gating Formulas for Aluminum Alloy Castings: A. J. Howarth

A Cuban Trainee Looks At U. S. Patternmaking: Luis Mojicar

Silica Sands—Sieve Analyses: A. I. Krynitsky, F. W. Raring

Modern Foundry Methods: Model Laboratory Provides Sand, Metal Research and Control

Metallurgy of Iron Base Rolls: F. E. Sutherland

Letters to the Editor

A.F.S. Glossary of Foundry Terms (Part II).

Directory of A.F.S. Chapters—1950-51 Officers and Directors

Abstracts of Technical Articles

Who's Who.

Foundry Personalities

Chapter Activities News

Chapter Officers and Directors

New Foundry Products

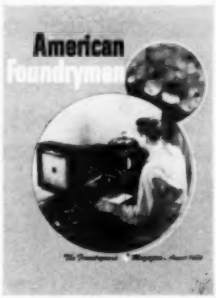
Foundry Literature

Foundry Firm Facts

Advertiser's Index

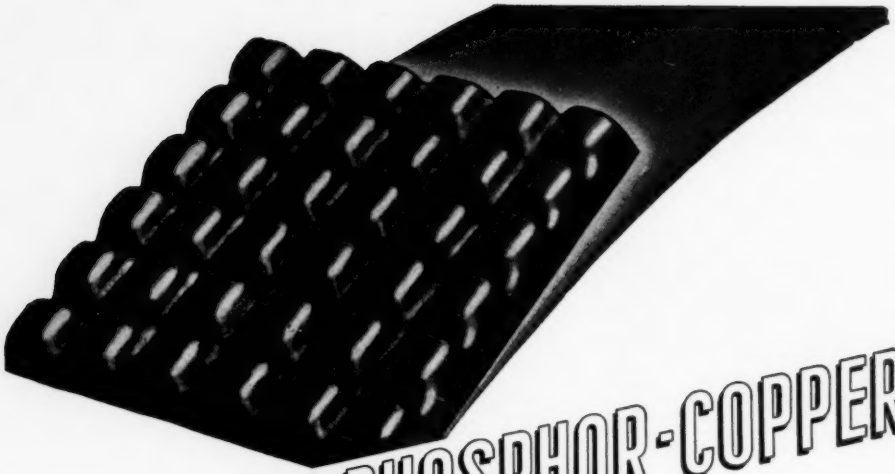
A.F.S. Employment Service

The American Foundrymen's Society is not responsible for statements or opinions advanced by authors of papers in its publication.



Use of metallurgical microscopes is not confined to examination of polished metal specimens. Here, in the laboratory of United States Graphite Co., Saginaw, Mich., an investigator studies a polished specimen of a core mold, in which a slug of cast iron melted and froze, to see what happened at the mold-metal interface.

Published monthly by the American Foundrymen's Society, Inc., 616 S. Michigan Ave., Chicago 5. Subscription price in the U. S., Canada and Mexico, $3.00 per year; elsewhere, $6.00. Single copies, 50c. Entered as second class matter July 22, 1938, under Act of March 3, 1879, at the Post Office, Chicago, Illinois. EASTERN REPRESENTATIVE—Warren Thomson Mayers Co., 130 East 61st St., New York. CENTRAL REPRESENTATIVE—Frank J. Enright, 16718 Kenyon Road, Cleveland. MIDWESTERN REPRESENTATIVE—L. F. McClure & Associates, 814 N. Tower Court, Chicago.



THE USE OF AJAX PHOSPHOR-COPPER

Send for booklet
"INGOT METALS OF TODAY"

●

15 STANDARD ALLOYS BY AJAX

Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax High-Tensile Manganese Bronze
Ajax Golden Glow Yellow Brass
Ajax Nickel-Copper 50-50%
Ajax Manganese Copper
Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

NOTE

"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

Successful foundrymen deoxidize or "clean up" molten metal by a scientific method worth using *as indicated:*

They use phosphorus . . expertly . . in the form of "Ajax Phosphor Copper" . . added as the crucible is removed from the furnace . . for virtually all brass and bronze alloys.

In notched waffle sections, or in shot form, Ajax 15% P-Cu does its work at .01% (1 oz. per 100 lbs.). Introduced, and having time to react when stirred with a whirling motion of the skimmer, it causes oxides to rise for effective removal by skimming from the surface. It is best to avoid phosphorus build-up from back stock.* . . If you use phosphorus these days, use Ajax Phosphor Copper (useful also in producing your phosphor bronze)

AJAX METAL DIVISION
ESTABLISHED 1880 *of* **H. KRAMER & CO.**

PHILADELPHIA

ELIMINATE METAL PENETRATION IN YOUR CASTINGS *with* STEVENS No. 125 CORE WASH

A High Fusion Point Core Coating for Iron and Brass Castings

● Stevens No. 125 Core Wash is the perfect core coating for your iron and brass foundry operations. Its high fusion point and strong bond allow the pouring of iron in heavy casting sections at extremely high temperatures.

In brass casting, No. 125's tight sealing qualities eliminate metal penetration into the sand by bronzes containing high lead, tin, zinc and phosphorus—all alloys which tend to "search" or "seep" into the core.

Stevens No. 125 virtually guarantees smooth castings and clean peel. Since it is white in color, it helps light up the mold cavity, permitting the more accurate setting of cores, and reveals clearly any misses and thin spots in the coating.

No. 125 Core Coating can be applied by brush, spray or dip. It stays in suspension, brushes out smoothly and sprays freely. It will not ferment, foam or bubble.

Stevens offers foundry service for every type of operation. If you have a casting problem—send us the complete data on your work and installation, and the Stevens technical staff will recommend a solution that will best serve your needs.

LEADING MANUFACTURERS AND DISTRIBUTORS OF FOUNDRY FACINGS, EQUIPMENT AND SUPPLIES

FREDERIC B. **STEVENS** INCORPORATED

DETROIT 16, MICHIGAN

BRANCHES • SALES OFFICES
BUFFALO • NEW HAVEN • INDIANAPOLIS • CLEVELAND
Representatives in Principal Cities

FREDERIC B. STEVENS OF CANADA, LTD.
WINDSOR • TORONTO
ONTARIO

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Division, Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How CHROMIUM BRIQUETS Increase Hardness and Strength of Cast Iron

Chromium briquets are made especially for the addition of chromium to cast iron in the cupola. The amount added may vary from small percentages up to as high as 15 per cent.

Function of Chromium in Cast Iron

Chromium is added to cast iron for the purpose of refining the grain and stabilizing the combined carbon content, thus increasing strength, hardness, and resistance to wear and abrasion. Even very small additions of chromium have a decided effect, and as little as 0.25 to 0.50 per cent will yield a great improvement in iron used for resistance to wear. A typical application is in automotive cylinder castings, particularly in heavy-duty truck and tractor work.

The stabilizing and refining effect of chromium is particularly useful to foundrymen producing castings of medium to heavy section. The slow cooling of such castings often results in weak, open-grained iron. Chromium in amounts up to 1.00 per cent will increase the stability of the structure of the castings and help to offset the effect of slow cooling in the mold.

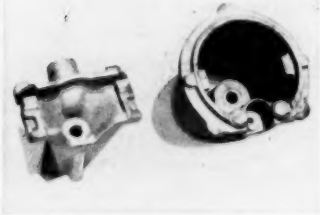


Fig. 1—These low-chromium iron castings, which are parts for a die-casting machine, are machinable, uniformly hard, and resistant to the effect of high temperature.

High-Temperature Service

The strong effect of chromium in stabilizing the structure of gray iron has made its use in iron subjected to high temperatures almost universal. Chromium in the range of 0.75 to 1.25 per cent greatly reduces the growth and warping that occur in unalloyed irons as the result of repeated heating and cooling. Chromium cast irons in this range of chromium content may be inoculated with silicon alloys to decrease the tendency to chill and, also, to assist in maintaining machinability. Such irons are adaptable to various high-temperature applications, such as melting pots, die-casting machine parts, grate bars, etc.

How Binder Protects Chromium

For the addition of chromium to cast iron, ELECTROMET produces briquets containing exactly 2 lb. of chromium each. The alloy is protected by a refractory binder, which has a high melting point and, therefore, helps to prevent oxidation of the chromium until it is melted and delivered to the crucible of the cupola.

The recovery of chromium from "EM" briquets is thus uniformly high, normally above 85 per cent, and it is easy to obtain the desired final chromium content. This is of particular importance when the limitations of hardness and machinability for a casting demand close chemical control.

Typical Briquet-Iron Mixture

The use of "EM" chromium briquets in the production of cast iron of low chromium content is shown in the table below.

Fig. 2—"EM" chromium briquets are hexagonal in shape, and each contains exactly 2 lb. of chromium. Notched briquets (right), which are easy to break in half, can be purchased for use when 1 lb. additions of chromium are desired.

The mixture given is for a medium-strength iron used for castings in which resistance to wear or heat is required.

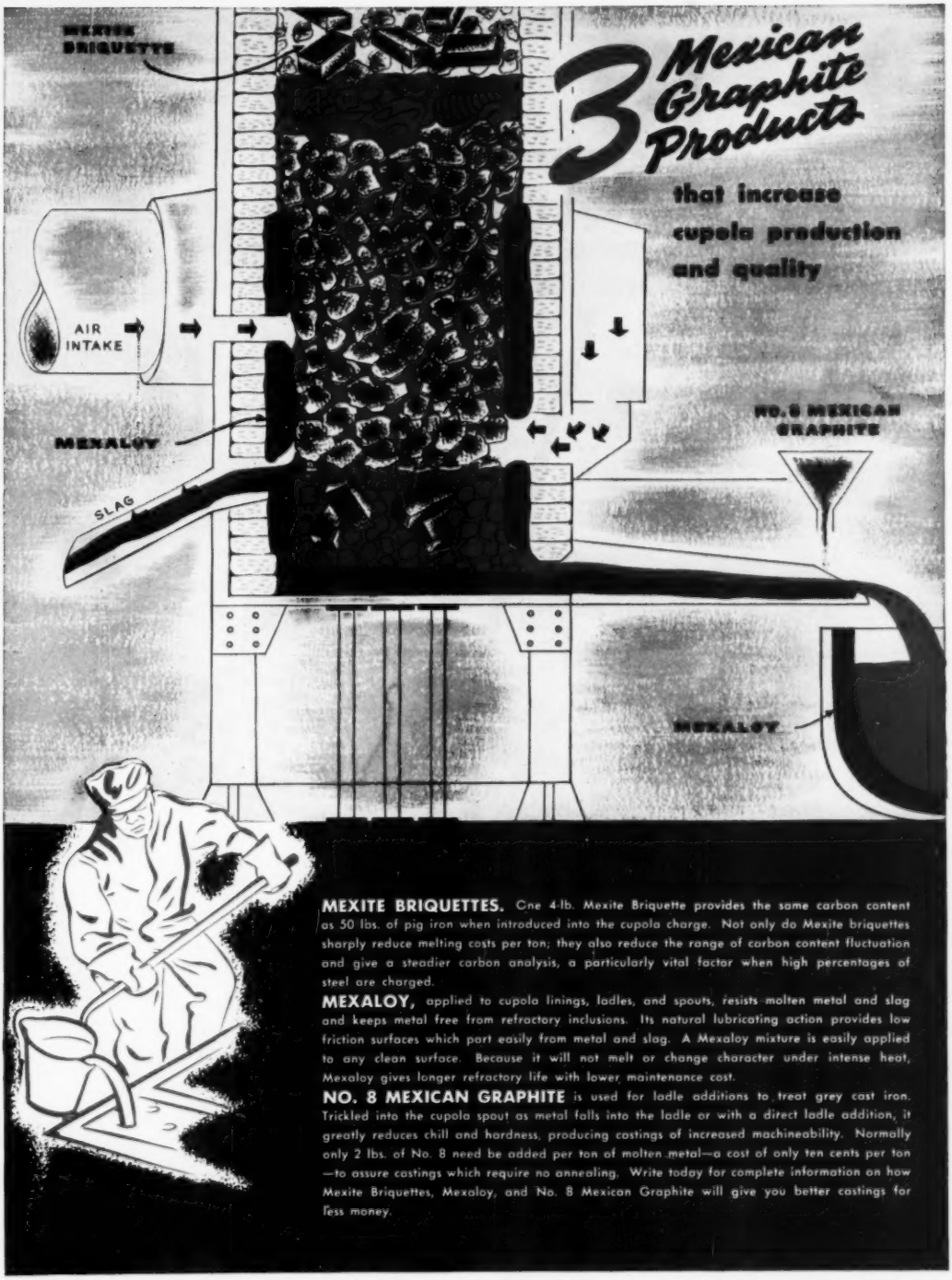
Booklet Available

Typical briquet mixtures for other types of irons are given in the booklet "Briquetted Alloys for the Iron Foundry Industry." This booklet also contains information about "EM" briquets of silicon, silicomanganese, and ferromanganese. If you would like a copy, free of charge, simply write to the address given above or to the ELECTROMET office nearest to you. Offices are in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York and San Francisco. In Canada: Welland, Ontario.

The terms "EM" and "Electromet" are registered trade-marks of Union Carbide and Carbon Corporation.

Typical Briquet Mixture for Low-Chromium Iron

Base Charge			Alloys in Charge Material					
			Silicon		Manganese		Chromium	
Per Cent	Lb.	Material Charged	Per Cent	Lb.	Per Cent	Lb.	Per Cent	Lb.
20.0	200	Pig Iron	2.25	4.50	0.85	1.70	—	—
30.0	300	Return Scrap	2.00	6.00	0.75	2.25	0.57	1.71
30.0	300	Purchased Scrap	2.00	6.00	0.65	1.95	—	—
20.0	200	Steel Scrap	0.10	0.20	0.45	0.90	—	—
100.0%	1,000 lb.	Total Base Charge		16.70 lb.		6.80 lb.		1.71 lb.
Briquets Required		5 Silicon Briquets		5.00		—		—
		1 Silicomanganese		0.50		2.00		—
		2½ Chromium Briquets		—		—		5.00
		Total Alloys Charged		22.20 lb. Si or 2.22% Si		8.80 lb. Mn or 0.88% Mn		6.71 lb. Cr or 0.67% Cr
		Melting Recovery		x .90		x .85		x .85
		Final Iron Analysis		2.00% Si		0.75% Mn		0.57% Cr



3 Mexican Graphite Products

that increase cupola production and quality

MEXITE BRIQUETTES. One 4-lb. Mexite Briquette provides the same carbon content as 50 lbs. of pig iron when introduced into the cupola charge. Not only do Mexite briquettes sharply reduce melting costs per ton; they also reduce the range of carbon content fluctuation and give a steadier carbon analysis, a particularly vital factor when high percentages of steel are charged.

MEXALOY, applied to cupola linings, ladles, and spouts, resists molten metal and slag and keeps metal free from refractory inclusions. Its natural lubricating action provides low friction surfaces which part easily from metal and slag. A Mexaloy mixture is easily applied to any clean surface. Because it will not melt or change character under intense heat, Mexaloy gives longer refractory life with lower maintenance cost.

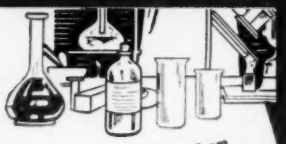
NO. 8 MEXICAN GRAPHITE is used for ladle additions to treat grey cast iron. Trickled into the cupola spout as metal falls into the ladle or with a direct ladle addition, it greatly reduces chill and hardness, producing castings of increased machineability. Normally only 2 lbs. of No. 8 need be added per ton of molten metal—a cost of only ten cents per ton—to assure castings which require no annealing. Write today for complete information on how Mexite Briquettes, Mexaloy, and No. 8 Mexican Graphite will give you better castings for less money.

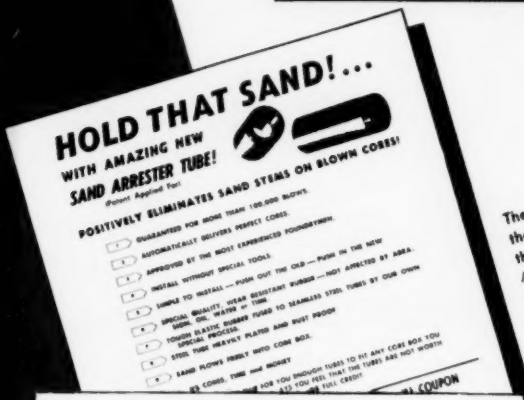
THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN

DIVISION OF THE WICKES CORPORATION

American Foundryman

Compounded to Stand the Test





HOLD THAT SAND!...
WITH AMAZING NEW
SAND ARRESTER TUBE!
(Patent Applied For)

POSITIVELY ELIMINATES SAND STEMS ON BLOWN CORES!

- GUARANTEED FOR MORE THAN 100,000 BLOWS.
- AUTOMATICALLY DELIVERS PERFECT CORES.
- APPROVED BY THE MOST EXPERIENCED FOUNDRYMEN.
- INSTALL WITHOUT SPECIAL TOOLS.
- SIMPLE TO INSTALL — PUSH OUT THE OLD — PUSH IN THE NEW.
- SPECIAL QUALITY — HEAT RESISTANT RUBBER — NOT AFFECTED BY AIRA, OIL, WATER or TIME.
- TOUGH PLASTIC RUBBER FUSED TO SEAMLESS STEEL TUBE! BY OUR OWN SPECIAL PROCESS.
- STEEL TUBE HEAVILY PLATED AND RUST PROOF.
- SAND FLOWS FREELY INTO CORE BOX.

NO CORES, TIME and MONEY [illegible] FOR YOU ENOUGH TUBES TO FIT ANY CORE BOX YOU [illegible] IF YOU FEEL THAT THE TUBES ARE NOT WORTH [illegible] FULL CREDIT!

[illegible] COUPON

MARTIN
ENGINEERING COMPANY

KEWANEE 9/13/49 ILLINOIS

Mr. John D. Murray, Adv. Mgr.
American Foundryman
222 W. Adams St.
Chicago 6, Ill.

Dear Mr. Murray:

Enclosed is a schedule of advertisements that our company has decided upon for American Foundryman. Frankly, we are very pleased with results to date. Coupons have been coming in consistently, and we are checking these carefully to gauge the market.

Of those received so far, American Foundryman has a distinct edge in the number of inquiries, with the advantage of an average ratio of 2 to 1 in sales over other publications.

It is on this record that we have decided to expand the schedule, per the enclosed.

Very truly yours,

MARTIN ENGINEERING COMPANY

E. F. Peterson

E. F. Peterson, Pres.

EFP/[illegible]

There is no mistaking results and, from the tone of the letter reproduced here, there is no mistaking the fact that AMERICAN FOUNDRYMAN, judged in terms of results, is the leading sales producer for the marketing of foundry equipment and supplies.

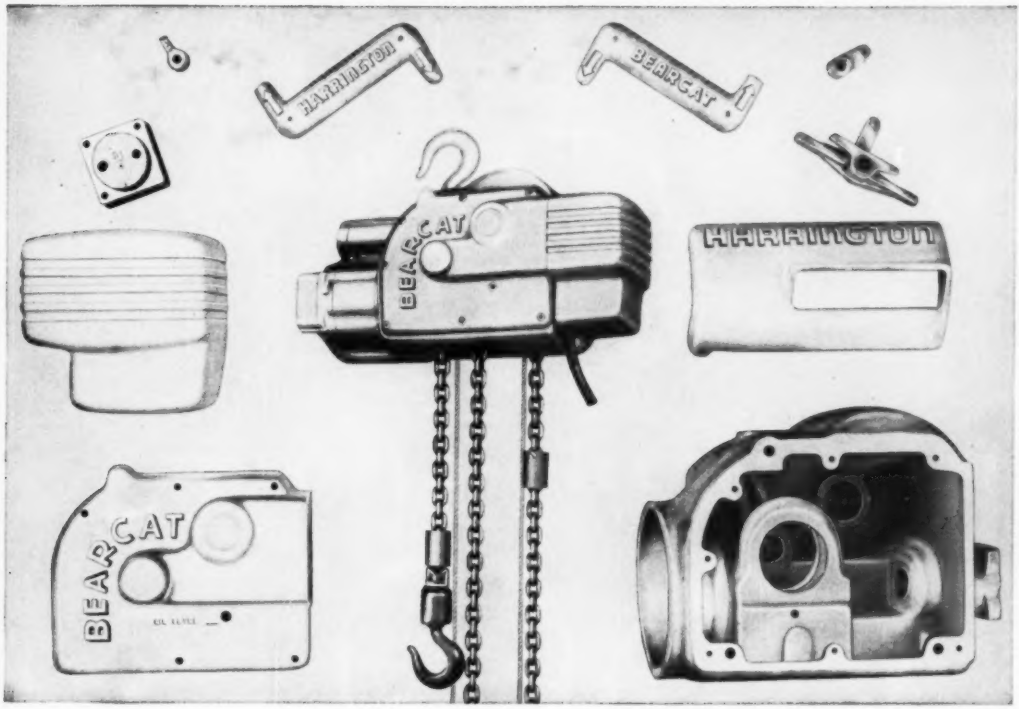
Yes, you've seen this advertisement reproduced in the pages of media reaching the foundry field, and you will be interested to know that the advertiser has kept a close tally on returns. The outcome was conclusive . . . AMERICAN FOUNDRYMAN **outpulled other magazines 2 to 1** in completed sales! This can mean only one thing—AMERICAN FOUNDRYMAN is the magazine that manufacturers can depend upon for results . . . **the kind of results that mean profitable advertising.**

AMERICAN FOUNDRYMAN can "pull" equally as many returns for those firms whose products are suited for use by the thousands of subscriber-members who regularly look to **The Foundryman's Own Magazine"** as a reliable source of information on the development and production of cast metals.

If AMERICAN FOUNDRYMAN isn't already scheduled for your 1949-50 sales program, it is only **good business** to do so immediately—it costs less than 2c per prospect to reach the readers of AMERICAN FOUNDRYMAN each month with an ad similar to the one reproduced above. Send for full details today!

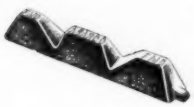
[illegible]n Foundryman

616 S. Michigan Ave.,
Chicago 5, Ill.



JM Lea. P80

Cut Weight, Eliminate Heat Treatment, Improve Properties — with TENZALOY



Casting ten parts of the Bearcat electric hoist (above) in TENZALOY enabled the manufacturer, The Harrington Company, Philadelphia, to:

1. Produce the article without heat treatment, thus saving an added expense.
2. Reduce castings' weight from an average of about 60 lbs. (original ferrous metal design) to 20 lbs., thus improving portability.
3. Cut machining and handling costs.
4. Improve appearance and corrosion properties, thus increasing sales appeal.
5. Virtually eliminate rejects.

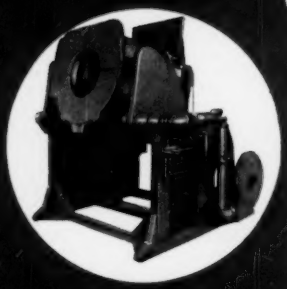
The Fisher Casting Company, North Plainfield, N.J., which cast the components shown above, is a longtime user of TENZALOY. Its competent staff knows well this aluminum-magnesium-zinc alloy which Federated developed to give high strength without heat treatment. Therefore, when they recommended TENZALOY, and worked with Harrington and Federated engineers on the project, they were certain of its eventual success.

This happy and profitable experience can be yours, too. Write Federated's Dept. CW for technical pamphlet on TENZALOY.

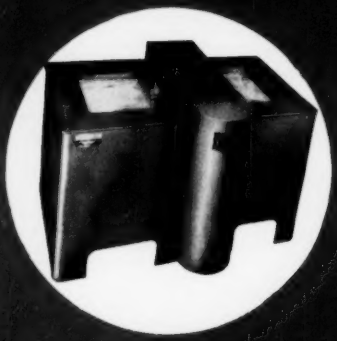
Federated — first in the new ferrous field. FMD

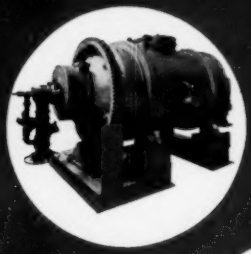
Federated METALS DIVISION

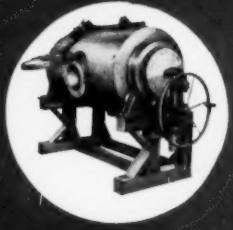
AMERICAN SMELTING AND REFINING COMPANY, 120 BROADWAY, NEW YORK 5, N.Y.



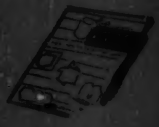
MELTING AND HOLDING FURNACES







Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.



Bulletin 231 covers the complete melting line. Write for your copy today.

LINDBERG-Fisher A DIVISION OF LINDBERG ENGINEERING CO.

2453 WEST HUBBARD STREET · CHICAGO 12, ILLINOIS

REJECTS AND SCRAP LOSSES ARE LOWER WHEREVER FOUNDRIES USE —

Famous CORNELL CUPOLA FLUX

Famous Cornell Cupola Flux has a background of more than thirty-two years of success in giving castings a better start.

It purges molten metal of impurities—greatly reduces sulphur and keeps slag fluid.

It makes iron hotter and freer flowing. You pour castings that are cleaner and tougher—and easier to machine due to big reduction of chilled sides, hollow centers and hard spots.

It greatly reduces cupola maintenance. Cupolas are kept cleaner, drops are cleaner, bridging over is practically nil, and there is definitely less erosion and repairing of brick or stone.

ORDERS ARE INCREASING FROM MALLEABLE FOUNDRIES, TOO. Wherever there is cupola operation, Famous Cornell Cupola Flux has proved a profitable investment.

Write for Bulletin No. 46-B

SCORED BRICK FORM

has these advantages:

Famous Cornell Cupola Flux comes to you in pre-measured form—no digging out of container—no weighing—no measuring—no waste—and no loss up the stack by force of blast.

You simply take it out of container and toss it into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges, as per instructions.

Famous CORNELL ALUMINUM FLUX

CLEANSES MOLTEN ALUMINUM so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive Formula greatly reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

The CLEVELAND FLUX Co.
1026-1040 MAIN AVENUE, N. W.
CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum Flux Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

Famous CORNELL BRASS FLUX

CLEANSES MOLTEN BRASS even when dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves you considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

WE STILL LIKE TO DO BUSINESS THE OLD FASHIONED WAY

(We manufacture modern ferro-alloys for precise alloying of fine steels)

Helpful Service

"Service with sales" is an age-old, time-tested slogan, and it continues to be the key to success and sound business relationships to this day. Our company was built on this premise, and our records show a steady increase in the number of satisfied users of our products.

Prompt Delivery

"Delivery-on-time" goes hand in hand with service. It is our sincere aim to meet scheduled deliveries on the date specified, to help you maintain production schedules.

Ferro-silicon 25, 50, 65, 75, 85, 90% • Special blocking 50% Ferro-silicon • Low Carbon Ferro-chrome Silicon • High Carbon Ferro-chrome • Ferro-manganese • Borosil • Simanal

PHILO © OFA 1935 RANGER © OFA 1941

Ohio Ferro-Alloys Corporation

Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma

BRIQUETS { SILICON MANGANESE CHROME SILICO-MANGANESE

Prescription for Core Troubles

℞ *Use Krause cereal binders and get these 4 big helps in making finer cores and castings*

1 **GET MORE GREEN STRENGTH**

2 **IMPROVE FLOWABILITY AND TEXTURE**

3 **PRODUCE FINER DETAIL**

4 **GET EASY BURN-OUT COLLAPSIBILITY**

For better, lower cost cores place a trial order for Krause Cereal Binders now — TRUSCOR if you like light weight; AMERIKOR if you prefer a heavier weight. Order through any of the distributors below or direct.

CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wisconsin
World's Largest Millers of Dry Corn

CEREAL BINDERS

DISTRIBUTORS

M. A. Bell Co.
3430 Brighton Blvd.
Denver, Colorado

M. A. Bell Co.
401 Velasco St.
Houston, Texas

M. A. Bell Co.
St. Louis, Mo.

A. L. Cavedo & Son, Inc.
Richmond 21, Va.

Foundry Supplies Co.
Chicago 16, Ill.

J. H. Hatten
Lansdowne, Pa

Schuler Equipment Co.
Birmingham, Alabama

Independent Foundry Supply Co., Los Angeles 11, Calif.

Marthens & Co.
Moline, Illinois

Carl F. Miller & Co.
Seattle 4, Wash.

Milwaukee Chaplet & Mfg. Co., Milwaukee 15, Wis.

Porter Warner Industries, Inc.
Chattanooga 2, Tenn.

Smith-Sharpe Co.
Minneapolis 14, Minn.

Snow & Golgiani
533-543 Second Street
San Francisco 7, California

Frederic B. Stevens, Inc.
Buffalo 12, N. Y.

Frederic B. Stevens, Inc.
Cleveland 14, Ohio

Frederic B. Stevens, Inc.
Detroit 26, Mich.

Frederic B. Stevens, Inc.
166 Brewery Street
New Haven 11, Connecticut

Western Industrial Supply Co.
208 S.E. Hawthorne Blvd.
Portland 14, Oregon

Cut CLEANING ROOM COSTS WITH FINER FINISH CASTINGS

DELTA S-5 BLACKOAT
CORE AND MOLD WASH

Delta Blackoat S-5 Core and Mold Wash, for grey iron castings, is a product of scientific research, conducted by Delta Foundry Research Laboratory in cooperation with one of the leading grey iron foundries in the mid-west. It's development solves critical difficulties, inherent in grey iron casting, which have persistently plagued foundrymen and foundry technicians.

Delta Blackoat S-5 is a distinctly new and different wash. It provides all of the well-known advantages of other Delta Core and Mold Washes plus the added advantages listed below.

Write for complete information. If you wish it we will send a liberal working sample to you for test purposes in your foundry.

5 IMPORTANT FACTS TO CONSIDER . . .

1. It's new and different. It has qualities and characteristics contained in no other wash. It substantially reduces cleaning room costs and greatly improves casting finish.

2. It produces results, on grey iron castings, unequalled by any other wash. It will not deform cores. Edges and corners remain clean and sharp.

3. It costs less to buy and is considerably more economical because you use it at a lower Baume.

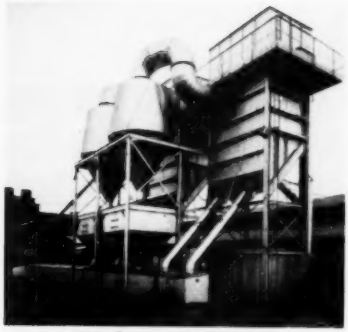
4. It can't flake or peel because it anchors itself by penetrating onto the sub-surface sand grains of cores and molds. It greatly increases the surface hot strength of the sand which prevents veining and metal penetration.

5. It is easily applied and adheres to any sand surface . . . green or dry . . . and produces a smooth, highly refractory, waterproof surface over which molten metal flows faster and without interruption.

DELTA OIL PRODUCTS CO.
MILWAUKEE 9, WISCONSIN

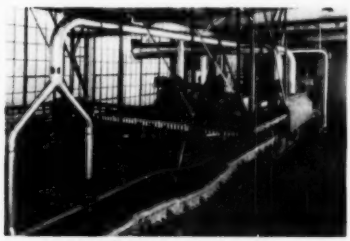
Schmieg CENTRI MERGE

Still the Best Answer to your FOUNDRY DUST and FUME PROBLEM



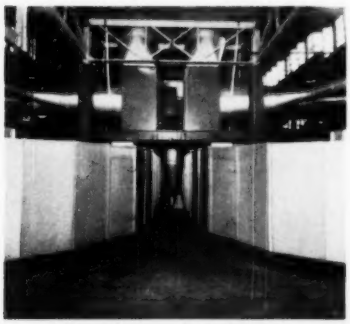
Cyclone Collector

Installed with cloth screen arrester on exhaust system for foundry and cleaning room. An arrangement, worked out by Schmieg engineers, by which the collector was installed ahead of the arrester greatly lengthened the life of the screens by reducing dust concentration.



Exhaust System

A typical exhaust system for foundry cleaning room equipment, such as wire brushing machines, etc., illustrates the advantages of using Schmieg equipment to solve dust and fume problems.



Hoods and Exhaust

No loss of efficiency caused by dust and fumes with these Schmieg hoods and exhaust system for foundry mould conveyor.

Here are Several Reasons Why

CENTRI-MERGE is *COMPLETELY* automatic in every phase of operation, *COLLECTS* dust and fumes as soon as they occur, *CLEANS* by high pressure water action, *DISPOSES* by mechanical conveyor. Dust and fumes are forced back on a stream of air to collection unit, washed and scrubbed from the air into tank below, permanently trapped under water for quick disposal as sludge.

1. **CENTRI-MERGE** greatly reduces heating cost by re-circulating cleaned air in many cases, occupies a minimum of valuable floor space, is easily installed.
2. **CENTRI-MERGE** gives non-fluctuating cleaning efficiency every minute of the day, collects and disposes of dust and fumes immediately.
3. **CENTRI-MERGE** operates at constant efficiency during many years of trouble-free service.
4. **CENTRI-MERGE** eliminates health or fire hazard in dust control by its automatic removal as sludge.
5. **CENTRI-MERGE** is always dependable, never requires a shutdown during working hours for cleaning or routine maintenance.
6. **CENTRI-MERGE** is engineered for minimum maintenance expense, is a compact, self-contained unit, constructed for flexibility of arrangement to suit plant requirements.

Consult Schmieg Engineers Today

THE *best* AIR PURGE *is* CENTRI MERGE

Schmieg INDUSTRIES INC.

Engineers & Manufacturers

308 PIQUETTE AVENUE · DETROIT 2, MICHIGAN

The perfect green bond...

MOGUL MAKES SMOOTHER CORES

LARGEST SELLER IN THE FIELD

MOGUL cuts drying time

MOGUL cuts down discards

Full technical service, without obligation, is available to show how you can profit from the use of MOGUL Cereal Binder in your production.

Write Technical Sales Department

CORN PRODUCTS
REFINING COMPANY
17 Battery Place • New York 4, New York

the preferred dry bond for cores

INTERCHANGEABLE

pending re

See how this large Mid-Western foundry has speeded up its modernization program ...getting full service life from its outmoded cast flasks by replacing them as they fail, with

BS&B

HEAVY DUTY
Fabricated Steel
FOUNDRY FLASKS

• Another triumph for the versatility of welded steel flasks! BS&B production facilities easily achieved matching duplicates, and the old cast flasks will serve out their full life.

Soon the whole shop will be modernized ...Heavy Duty Welded Steel Flasks throughout. Full gauge metal adds extra strength. Two-piece bearing-bar is wider and thicker . . . may be machined four or five times to renew the surface. Double welding of bearing bar prevents warping, insures full bearing surface, adds great strength. BS&B construction does not require stress-relieving or normalizing.

You, too, can get far longer service with BS&B Welded Steel Flasks. Built to specifications, or standard sizes to meet every casting need. BS&B also manufactures all-steel bottom boards and core plates.

Remember, BS&B builds your business with hard-hitting advertising to casting BUYERS in STEEL, IRON AGE, PURCHASING. Look for them. Profit with B&SB!

Call your nearest BS&B DISTRIBUTOR TODAY

BIRMINGHAM, ALA.
Foundry Service Co.
BOSTON, MASS.
Klein-Farris Co., Inc.
CHICAGO, ILL.
S. Obermayer Co.
CINCINNATI, OHIO
S. Obermayer Co.
CLEVELAND, OHIO
C. L. Nash
Hoffman Fdry. Sup. Co.
1193 Main St.
DAYTON, OHIO
Fenton Foundry Sup. Co.
DETROIT, MICH.
Wolverine Fdry. Sup. Co.
E. J. Woodison Co.
EDWARDSVILLE, ILL.
Midwest Fdry. Sup. Co.
ELMIRA, N. Y.
F. F. Shortsleeve Co.
HOUSTON, TEX.
M. A. Bell Co.
LOS ANGELES, CALIF.
Independent Foundry Supply Co.
MINNEAPOLIS, MINN.
Wissner & Co.
MONTREAL, CAN.
Canadian Foundry Sup. & Equipment, Ltd.
OAKLAND, CALIF.
Pacific Graphite Co., Inc.
PHILADELPHIA, PA.
Pennsylvania Foundry Sup. & Sand Co.
PITTSBURGH, PA.
S. Obermayer Co.
ST. LOUIS, MO.
M. A. Bell Co.
SEATTLE, WASH.
Carl F. Miller & Co.
TORONTO, CAN.
Canadian Fdry. Sup. & Equipment, Ltd.

Get Yours FREE!

Permanent, Leather-bound Foundry Flask "Bible"

BLACK, SIVALLS & BRYSON, INC.
Section 13-58-8
720 Delaware, Kansas City 6, Mo.

• Please send your leather-bound loose-leaf "Foundry Flask Bible", the pocket-sized fact and figure book. ☐ Have a sales Representative call. No obligation, of course.

NAME _____

FIRM _____

ADDRESS _____

CITY _____ **ZONE** _____ **STATE** _____

FERRO MANGANESE FROM TENNESSEE

You can save freight costs by ordering mixed cars of Ferro Manganese, Ferro Silicon and briquettes. Specify standard grade lump, regular sized or briquettes in bulk or containers.

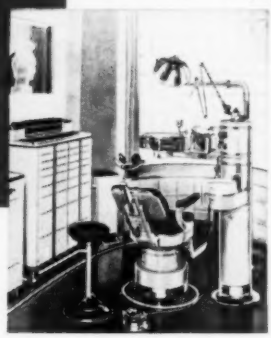
Test Tennessee's dependability—place an order for your next requirement of Ferro Manganese.

AGENTS:
Miller & Co., Chicago, St. Louis, Cincinnati
S. H. Bell Co., Pittsburgh
T. H. Benners & Co., Birmingham

EXPORT AGENT:
Ore & Ferro Corporation, 30 Broad St., New York

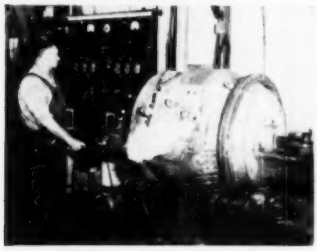
TENNESSEE PRODUCTS & CHEMICAL *Corporation*
NASHVILLE, TENNESSEE

HOW MANY CASTINGS in a DENTIST'S EQUIPMENT?



S.S.WHITE makes 'em all with DETROIT ROCKING ELECTRIC FURNACE melts

S. S. White Dental Manufacturing Company, in its Staten Island plant, makes everything a dentist needs. A great many castings go into the making of chairs, tables, control and operating equipment.



Type LFC Detroit Rocking Electric Furnace. Capacity 350 lbs., melting nickel alloy iron.

All metal used in this wide variety of precise castings is melted in Detroit Rocking Electric Furnaces.

Read the Advantages!

Here are the advantages that Detroit Electrics deliver at S. S. White: Better control of analysis. Smoother surface finish—important because many of the castings are enamelled or chrome plated. Accurate temperature control. Added gains are cleaner operation, improved working conditions, and savings in floor space.

You, too, may well profit from Detroit Rocking Electric Furnaces. You can get better castings, fewer rejects, higher usable yields, faster melts. Electrodes are always clear of the molten bath, eliminating carbon pickup. Indirect arc and automatic electrode adjustment assure optimum power use.

Linings of these great furnaces last longer. Replacement linings, when necessary, are quickly installed.

Get the Facts

For ferrous or non-ferrous metal melting, Detroit Rocking Electric Furnaces have much to offer you. Send us your production data. Our engineers will give you the facts on the benefits that can be yours.

Capacities from 10 to 4000 lbs. Conical or cylindrical chambers.

WRITE TODAY!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

Foreign Representatives: In BRAZIL—Equipamentos Industrias "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Casco, S. de R. L. Atenas 32, Despacho 14, Mexico City, D. F.

GREATER CAPACITY

in TONS

per batch...
per hour...
per day...

When it comes to turning out more tons of properly conditioned and cooled sand, with resulting high mold capacity per working day, you just can't beat the high efficiency of SIMPSON MIXERS. Yet with this high productive capacity, you actually require fewer mixing cycles per hour, because of the large batch capacity of the mixers. Thus, with greater capacity and fewer mixing cycles, you have ample time to take frequent sand samples, to accurately determine and improve sand quality for a net result of more good castings at lower cost.

ABOVE: Typical No. 2 SIMPSON MIXER unit, with NATIONAL Bucket Loader, Aerator and Water Meter. LEFT: No. 3 SIMPSON MIXER preparing backing and facing sands in foundry of a large machine tool manufacturer.

** Rated batch capacities of SIMPSON MIXERS are not theoretical figures . . . they are proved on the job in hundreds of large and small foundries all over the world. Ask to have a National Engineer show you how to increase production, improve quality and lower cost.*

Batch Capacities of Simpson Mixers*

No. 3½ Mixer	5000 lbs.
No. 3 Mixer	3000 lbs.
No. 2 Mixer	1500 lbs.
No. 1½ Mixer	700 lbs.
No. 1H Mixer	400 lbs.

***Based on actual practice in hundreds of foundries.**

SIMPSON Intensive MIXERS

NATIONAL *Engineering Company*

600 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

FOREIGN FOUNDRY DEVELOPMENTS MERIT ATTENTION

WE HAVE developed in America the egocentric but comfortable trend of thought that at least in technical matters we have advanced far beyond other nations. We point to our truly astounding record of production and technological advance to substantiate this. However, a recent extensive tour of the foundries of continental Europe and England has provided convincing evidence that our foreign colleagues are employing in commercial foundry production many techniques and practices which have been neglected in this country. In many instances these could be incorporated into our foundries to our decided advantage.

It is true that many European practices which find no counterpart in America have developed out of stark necessity. Foreign foundries have always labored under the multiple handicaps of raw material shortages, artificial trade barriers, politically manipulated currencies, and trade guild-sponsored production limitations. We in America with our superabundance of raw materials, free trade, and relatively stable political conditions have not been driven to the measures necessary for commercial survival abroad.

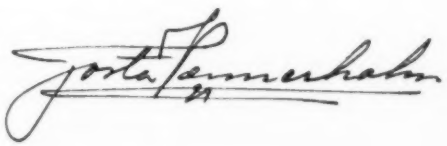
An outstanding example of an interesting practice born of necessity is the use in Belgium of the externally water-cooled cupola employing a blast preheated to an extent used in America only in blast furnaces. The Belgian foundrymen were faced with a complete dearth of pig iron and evolved this practice to obtain a satisfactory product from an all steel charge. The highly preheated blast is obtained in ferrous heaters containing over two per cent of scarce alloys. To accommodate the very hot blast, water-cooled tuyeres extending at least 10 inches into a 40-in. cupola have been developed.

Somewhat better known in America is the so-called Croning process, a foreign innovation in which a shell mold is prepared by showering a mixture of dry sand and uncured resin on a heated metal pattern. Germany has also contributed some interesting continuous sand mullers, and a process for the production of cylinder heads in two separate castings which are then flash welded into a unit.

In England some highly interesting molding machines well adapted to mold cylinder blocks have been perfected. These machines eliminate jolting of the molds which are produced with excellent uniformity, hardness, and finish. The British foundry industry has been obliged to operate cupolas on 16-hr blast furnace coke instead of the more desirable cupola coke. To produce sound castings despite the difficulty in obtaining adequate spout temperatures with this inferior fuel, a new pouring system has been evolved in which the molten iron is transferred from the cupola to the mold with an absolute minimum of thermal loss. This country has also employed water-cooled cupolas but has used internal rather than external cooling.

Sweden has substituted her plentiful "white coal" for the scarce conventional fuels very extensively through the use of power frequency induction furnaces.

These foreign practices and innovations have been touched upon not in derogation of our efforts in America, but rather to stimulate a growing movement to interchange technical information more freely and to incorporate into our industry more promptly those worthwhile foreign developments which are not inconsistent with our economic system.



GOSTA VENNERHOLM,
Supervisor Metallurgical Research
Ford Motor Co.

Gosta Vennerholm received the Wm. H. McFadden Gold Medal of the American Foundrymen's Society in 1949 "for outstanding contributions to the castings industry in the field of ferrous metallurgy and practice." *Internationally known as an authority on metallurgy and metallurgical control of ferrous metals, he has been co-discoverer of many cast alloys and casting methods. A native of Sweden, Mr. Vennerholm graduated from Technical College, Stockholm, and taught in Germany before coming to the United States in 1924 to start work in the physical laboratories of the Ford Motor Co., Dearborn, Mich. From 1933 to 1938 he supervised the reorganization of Ford foundries in Europe. A frequent speaker on technical topics and contributor to the technical literature, he is chairman of the A.F.S. Annual Lecture Committee.*

A.F.S. Secretary-Treasurer Wm. W. Maloney (right) points out detail of new A.F.S. Headquarters to, left to right: National Directors L. C. Farquhar, Sr., J. J. McFadyen, Edwin W. Horlebein (retiring National President), President Walton L. Woody, Director T. E. Eagan, Vice-President Walter L. Seelbach, A.F.S. Technical Director S. C. Massari, Directors Martin J. O'Brien, Jr., and Lloyd D. Wright.

ADVANCEMENT OF INDUSTRY IS THEME OF A.F.S. BOARD MEETING

ANNUAL MEETING of the 1949-50 Board of Directors of A.F.S. and the first meeting of the 1950-51 Board were held at the Drake Hotel, Chicago, July 27 and 28. Preceding the meetings was an orientation session for new officers and directors at A.F.S. Headquarters July 26. Full details of the meetings briefed below and financial reports will be published in the 1950 TRANSACTIONS OF A.F.S.

Retiring President E. W. Horlebein presided at the annual meeting which closed the Society's activities for the fiscal year July 1, 1949-June 30, 1950. Officers and Board members reviewed particularly the finances as reported by official CPA auditors, and heard and accepted detailed reports of the secretary, treasurer, and technical director.

Secretary-Treasurer Wm. W. Maloney reported that the membership on June 30 was 9046, representing a loss of about 10 per cent from the July 1, 1949, total. He reported the establishment of student chapters at Michigan State College and the University of Alabama.

Reports of the various officers and Board committees were reviewed for the purposes of planning for the year ahead. Retiring President Horlebein called attention to the recent death of three outstanding members of A.F.S.—Past President Thomas S. Hammond, and Gold Medalists R. G. McElwee and A. W. Gregg—and the secretary was directed to prepare appropriate resolutions expressing the Society's feelings on the loss of the valued members, to spread them on the minutes of the meeting, and to send copies to the families and firms of the deceased.

On the adjournment of the meeting, Retiring President Horlebein passed the gavel to Incoming President Walton L. Woody who called the meeting to order and introduced Vice-President Walter L. Seelbach. First order of business was the election of N. J. Dunbeck, F. G. Sefing, and V. E. Zang to the Executive Committee to serve with President Woody, Vice-President Seelbach, and Past President Horlebein. First day's meetings ended with the Third Annual Dinner for the retiring directors.

The first full meeting of the 1950-51 Board convened July 28 with President Woody presiding. In an all day session a number of progressive steps were taken to advance A.F.S. and the industry it represents. Wm. W. Maloney was re-elected secretary-treasurer following which the Board considered in detail and approved the budget of income and expense for July 1, 1950-June 30, 1951, as recommended by the Finance Committee. It was reported that the Society earned in excess of $120,000 during 1949-50 from which appropriations would be made to finance the usual expected

Secretary Maloney (background) explains editorial operations on AMERICAN FOUNDRYMAN *to interested officers and directors on tour of National Office.*

operating deficit of the Society in alternate years.

Forward looking measures included in actions of the Board of Directors are:

1. A.F.S. Housing Project. Unanimous approval was expressed for the adoption of a program expected to provide a permanent headquarters for A.F.S. President Woody announced that approximately $30,000 had been pledged, pending Board approval of the housing project, since the idea was initiated at the A.F.S. Alumni Dinner during the recent Convention and discussed with chapter officers at the Chapter Officers Conference. Plans for the creation of a Building Fund had met with approval of every Society member with whom he had discussed them, he stated. The Board authorized continuance of the plan to raise a $100,000 Building Fund over the next three years.

A.F.S. National Vice-President Walter L. Seelbach (center) and Director J. J. McFadyen watch Annabelle McGreevey processing new A.F.S. memberships.

Directors L. C. Farquhar, Sr., (at back) and T. E. Eagan examine National Office book storage stacks.

The necessary committees will soon be appointed, it was announced, to decide location, type of structure, financing methods, and the like, subject to final approval of the Board. Further information will be announced in the September issue of the American Foundryman.

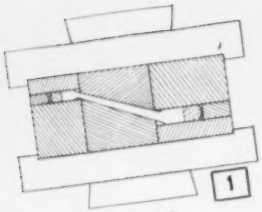
2. 1952 International Foundry Congress. Past President Horlebein reported that he and Secretary-Treasurer Maloney had inspected facilities for holding the 1952 International Foundry Congress and Exhibit in Atlantic City as directed by the Board last January. Upon his recommendation, the Board approved At-

(Continued on Page 64)

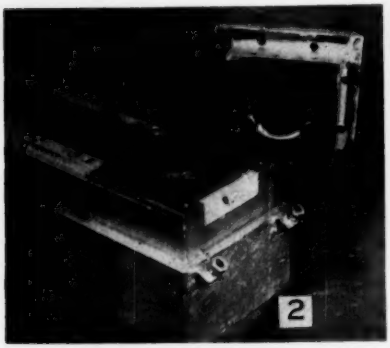
Last meeting of 1949-50 Board of Directors was held July 27 at Chicago's Drake Hotel with incoming officers and directors as observers. Starting left around table: Directors V. J. Sedlon, Martin J. O'Brien, Jr., N. J. Dunbeck, John M. Robb, Jr. (retiring), T. H. Benners, Jr., Robert Gregg, T. E. Eagan, F. C. Riecks (retiring), V. E. Zang, Incoming Vice-President Walter L. Seelbach, Incoming President Walton L. Woody, Incoming Directors F. W. Shipley and Edwin W. Horlebein (retiring President), A.F.S. Secretary-Treasurer Wm. W. Maloney, Technical Director S. C. Massari, Directors W. B. Wallis (retiring), L. C. Farquhar, Sr., E. N. Delahunt (retiring), Incoming Directors J. J. McFadyen, James Thomson and E. C. Troy, Retiring Director W. J. MacNeill and Directors Fred G. Sefing and Lloyd Wright.

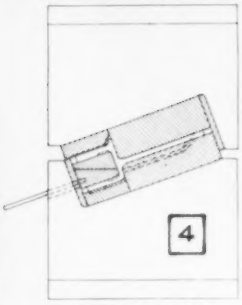
DIES FOR A MALLEABLE PRODUCTION FOUNDRY

K. L. Sanders
Albion Malleable Iron Co.
Albion, Mich.

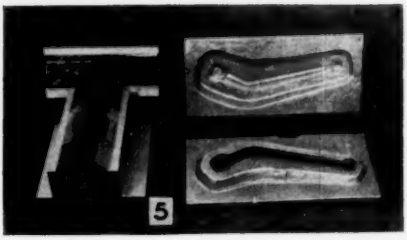


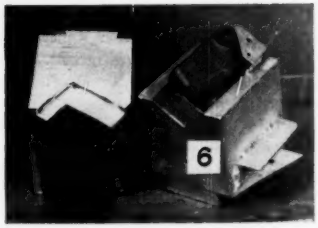
FLAT DIE

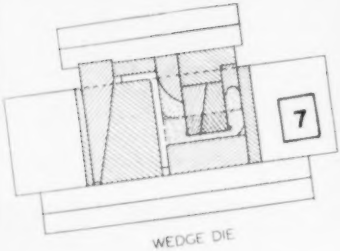




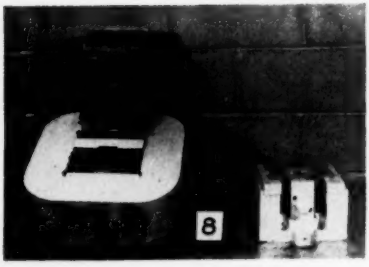
ANGULAR V-TYPE DIE

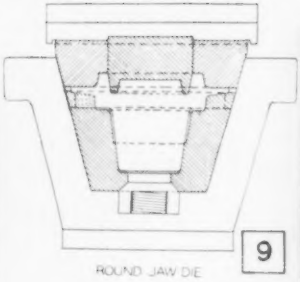




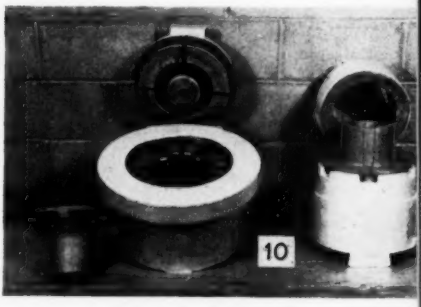


WEDGE DIE





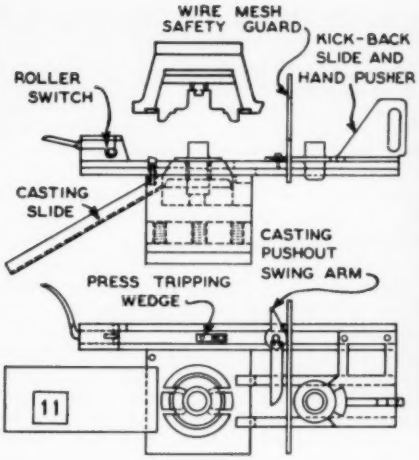
ROUND JAW DIE

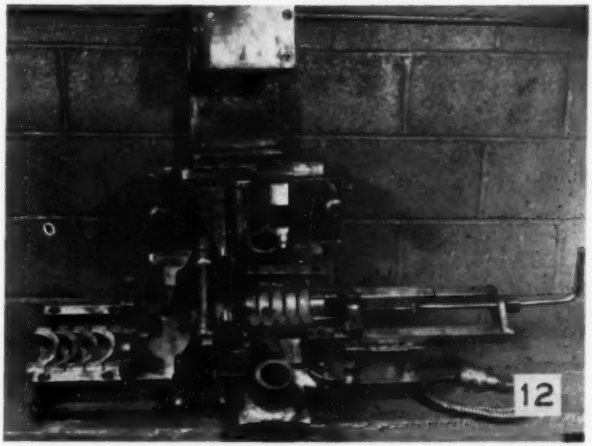


Close control of dimensional tolerances and general physical characteristics of castings should command the same close attention that metallurgical control has received. The customer's first consideration upon receiving a casting is whether or not it is of proper size. Regardless of how good the metal is—whether it has a yield point of 40,000 psi and an elongation of 20 per cent—makes little difference if the casting is not within the customer's dimensional tolerances. This does not mean that metal quality is not of utmost importance for it is the very nature of good malleable that makes it possible to press and force it into proper shape, thereby assuring dimensional accuracy.

Constant effort must be made to perfect straightening methods and equipment from the standpoint of effectiveness and production. Machining difficulties as a result of poor straightening or pressing must be eliminated. Troubles that can stem from castings not dimensionally accurate include surfaces which fail to clean up, sections which vary after machining, or, in the case of improper chucking, expensive tools and equipment which are damaged. Any of these which result from the foundryman's failure to produce quality castings makes him easy

NOTE: This paper was presented at the Malleable Round Table Luncheon, 54th Annual Meeting, American Foundrymen's Society at Cleveland, May 8-12, 1950.





prey to various competitive methods of metal forming.

Inasmuch as the price of metal is currently a big factor the cost of straightening must be considered. Is it being done effectively? Is production per man as high as it could be? Will changed methods improve output? Is new equipment needed? These are questions that must be considered, and with each casting, quality must be the guide.

The author's company has given a great deal of consideration to more effective straightening in the interests of better quality and lower costs. Some of this work on die equipment is described in this article.

Determine Suitable Die Type

Four basic types of dies are used in the straightening of castings. In the first stage of designing a die for a new casting, the type of die to do the best job must be selected. Sometimes a combination of two or more basic designs is necessary.

First is the flat die which appears in Fig. 1. This shows a mild steel base plate with tool steel inserts mounted on the top and the same for the top die, with thickness stops between for holding the required dimensions of the casting. Thickness stops are necessary on this type of die when used in a hydraulic press.

Figure 2 shows a flat die with about the same arrangement of inserts as the die shown in Fig. 1, but it also has centering jaws that hold the casting in position for the top die to strike flat and to size. This type of die with added guide posts and punches mounted in the top die and with relief slots in the bottom die can be made to punch out slotted and round holes in the castings at the same time they are being straightened.

An irregular under-surfaced die is shown in Fig. 3. This type of die requires re-surfacing as the inserts become worn. The stepped surfaces in the front can be ground straight through by removing the two side blocks. This feature aids in keeping repair cost to a minimum.

Figure 4 shows the second basic or V-type straightening die used which can be made to press many different shaped castings, such as pedals, levers, spring pads, spring hangers, and various other types and shapes.

The pressing operation shown in the sketch squares the mounting faces of a large spring hanger casting, and spaces the two shackle bosses into dimensional relation to the rest of the casting.

Figure 5 (left) shows a V-type die which straightens the casting and also presses the two end pads, which are at right angles to each other, to a specified thickness. This die can be easily repaired and re-surfaced; the small parts which receive most of the wear can be replaced with but little down time for the press. The right-hand die in this figure is an obsolete lever die which had to be re-worked or scrapped after much use. Also, it is difficult to make any dimensional changes.

Another V-type die, which is used for a casting with two faces at right angles to each other and a long boss that has to be pressed to a given length, is shown in Fig. 6. The inserts on this die are arranged so that when in need of re-surfacing they can be easily removed and ground straight through on the faces of each insert.

Figure 7 shows the third basic type of die, which is a wedge die generally used when the design of the casting is such that straightening is required in two directions. The large wedge furnishes the pressure for straightening sideways, along with the direct vertical pressure of the press. The wedge used on a die of this type usually has a 15 to 20 degree angle.

The wedges in this die are lubricated with a pasty graphite grease which adheres to the surface for a longer period than ordinary oil lubricants. The small center wedge has a 15 degree angle, and is usually greased with a mixture of graphite and oil to prevent sticking when in a closed position.

In Fig. 8 (left) the same wedge die (Fig. 7) is shown with the split wedge in the center for holding the dimension between the two shackle bosses of the casting. For comparison the old style die is shown at the right (Fig. 8). This die has a solid plug in the center on a handle, which had to be driven in and usually back out to hold the dimension between the bosses.

The fourth basic type of die (Fig. 9) has round split jaws in the top and also in the bottom. Springs are mounted between the jaws, which open to admit the casting. This type of die will press the casting barrels round, and the flanges flat and square to the center line of the casting.

Figure 10 (left) shows practically the same jaw die, and for comparison (right) an obsolete ring die which would only press the flange flat. The steel used in these jaw dies is usually a cast carbon steel of 0.40-0.50 carbon, and a mild steel base.

Another type of double-jaw die has springs between the split jaws and serrations on the machine finished side which take care of any difference of stock thickness or surplus caused by molding conditions. This surplus stock is forced into the serrations, allowing the bottom side of the casting to be pressed flat. The extra stock is removed in the first machining.

The drawing of a jaw die (Fig. 11) shows a slide at the front which enables the operator to stand out from under the press. A casting is placed on the slide in position for pressing, and pushed into the die at the same moment the casting in the die is being carried out at the back. At the end of this stroke the press trips and the push lever returns for the next casting.

A more complicated pressing die is shown in Fig. 12. This die shears off the gates, presses the radii, and brings all the castings to a uniform thickness. Nearly all of the basic designs can be changed into this push-through type die. The old method of pressing this casting would produce on an average 8 to 10 per min; with the present design 16 to 20 can be produced.

Figure 13 shows the operator placing a casting in position on the slide. The wire mesh screen used on all semi-automatic push-through dies keeps the operator's hands away from the die at all times.

A.F.S. RESEARCH PROJECTS

Research projects of A.F.S. are conducted under definitive contracts with various institutions which have the necessary personnel and mechanical facilities. Reports on each project are required at regular intervals.

"Research" is just that—*search* and *re-search*. It is not like production where reasonably well-known materials, proved methods and engineered designs are employed to turn out salable products. Research commences with an idea and many unknown factors, all of which must be examined by trial and error before the actual idea itself can even be approached.

Results of A.F.S.-sponsored research, when in publishable form, are available to everyone. Quarterly progress reports and visits and consultation with the researchers keep the committees directing the work informed on project developments. Annual reports on the various researches under Society sponsorship will become a regular feature of the Annual A.F.S. Convention.

Title of Project	Group Directing Work	Institution
Hydraulics of Light Metal Flow into Molds	Research Committee, Aluminum and Magnesium Division	Battelle Memorial Institute
Fracture Test as an Index of Melt Quality	Research Committee, Brass and Bronze Division	University of Michigan
Centrifugal Casting of Light Metal Alloys	Centrifugal Casting Committee, Aluminum and Magnesium Division	Canadian Bureau of Mines
Influence of Heredity on Coke Behavior in the Cupola	Cupola Research Committee	U. S. and Canadian Bureaus of Mines, Ford Motor Co., and Eaton Mfg. Co.
Fundamentals of Heat Flow During Casting Solidification	Heat Transfer Committee	Columbia University
Second Project Under Consideration	Research Committee, Malleable Division	
High Temperature Properties of Molding Sands	Research Committee, Sand Division	Cornell University
Relation of Cores to Hot Tearing	Research Committee, Steel Division	Armour Research Foundation
Risering of Gray Iron	Research Committee, Gray Iron Division	Massachusetts Institute of Technology

COPPER ELECTRODEPOSITION FROM ALUMINUM ALLOYS CONTAINING TIN AND ANTIMONY

George Norwitz*
Material Laboratory
New York Naval Shipyard
Brooklyn, N. Y.

PUBLISHED ELECTROLYTIC METHODS[1, 2] for the determination of copper in aluminum alloys containing tin and antimony call for a sodium sulphide separation of the copper from the tin and antimony, prior to the electrolysis of the copper. In this paper a direct method is proposed for the determination of copper in this type of alloy. The procedure employs a technique developed by the author for the electrolytic determination of copper in tin-base alloys.[6]

Procedure

Dissolve a 1-gram sample contained in a 300-ml electrolytic beaker with an acid mixture made by mixing 20 ml of phosphoric acid (85 per cent), 15 ml of hydrochloric acid (36 per cent) and 10 ml of nitric acid (70 per cent). Wash down the sides of the beaker with a little water. Heat strongly on the hot plate without a cover glass until the hydrochloric and nitric acids have been driven off (about 30 min). Allow to cool (but not to room temperature), add about 70 ml of water and stir well. Heat to boiling and boil for 10 min to convert the pyrophosphoric acid to phosphoric acid.[6]

Add 10 ml of nitric acid (70 per cent) and dilute to 200 ml. Electrolyze the warm solution at 2 amperes for 15 min, using platinum gauze cathodes (60 mm in height and 50 mm in diameter), and platinum spiral anodes. During the electrolysis stir the solutions by some suitable means. Immerse the cathode in water and then in alcohol. Dry it in an oven at 105 C for 5 min, cool, and weigh the deposit as metallic copper.

TABLE 1.—RESULTS FOR COPPER IN ALUMINUM ALLOYS CONTAINING TIN AND ANTIMONY.

Sample	Cu Present, per cent	Cu Found, per cent	Contains, per cent
1	0.20[3]	0.18 0.18	6.12 Sn
2[1]	4.03	4.02 4.05 4.06	3.06 Sn
3[2]	7.87	7.89 7.88	10.0 Sb
4[1]	4.03	4.04 4.04	3.06 Sn, 10.0 Sb
86b	7.87[3]	7.85 7.87	0.00 Sn, 0.00 Sb

[1]Synthetic sample made from 0.5 gram of sample 1 and 0.5 gram of 86b.
[2]Synthetic sample made from 1 gram of 86b and 0.100 gram of finely divided metallic antimony.
[3]Synthetic sample made from 0.5 gram of sample 1, 0.5 gram of 86b and 0.100 gram of metallic antimony.
[4]Tin separated from copper by means of sodium sulphide, copper sulphide dissolved in HNO_3 and solution electrolyzed.[5, 2]
[5]National Bureau of Standards certified value.

The results obtained for copper in aluminum alloys containing tin and antimony are shown in Table 1.

The electrolysis should not be continued for more than 20 min if antimony is present; otherwise, some antimony may deposit with the copper. If tin alone is present, the time for the electrolysis is not at all critical. Electrolysis of sample 2 (see Table 1) for 4 hr gave a result that was only 0.03 per cent too high.

In investigating the possibilities of the method, using synthetic samples, the author observed a very peculiar and interesting reaction that throws light on the mechanism of the dissolution of silicon in phosphoric acid.[3, 9] It was found that metallic copper precipitated on dissolving an aluminum alloy containing several per cent of copper and several per cent of silicon in a mixture of phosphoric, hydrochloric and nitric acids, and heating strongly to drive off the hydrochloric and nitric acids. This reaction would seem to indicate that orthophosphorus acid or hypophosphorus acid is formed when silicon is dissolved in phosphoric acid, since these are the only acids of phosphorus capable of reducing copper salts to metallic copper.[8] Commercial aluminum alloys which contain tin and antimony do not contain sufficient silicon (over 3 per cent) to precipitate copper from a phosphoric acid solution of the sample.

If an acid mixture containing both sulphuric acid and phosphoric acid is used to dissolve an aluminum alloy containing silicon,[3, 4, 5, 6, 7] the precipitation of copper will not take place.

Acknowledgment

The author wishes to thank W. L. Miller for his suggestions and continued interest.

References

1. Aluminum Co. of America, *Chemical Analysis of Aluminum*, p. 31, New Kensington, Pa., 1941.
2. British Aluminum Co., *Chemical Analysis of Aluminum and Its Alloys*, p. 75, London, England, 1947.
3. H. Fuchshuber, *Z. anal. Chem.*, 116, 421 (1939).
4. P. Lisan and H. L. Katz, *Analytical Chemistry*, 19, 252 (1947).
5. G. Norwitz, *Analytical Chemistry*, 20, 182 (1948).
6. G. Norwitz, *Analytical Chemistry*, 21, 523 (1949).
7. G. H. Osborn and J. Clark, *Metallurgia*, 31, no. 185, 230 (1945).
8. A. B. Prescott and O. C. Johnson, *Qualitative Chemical Analysis*, pp., 489, 90, New York, D. Van Nostrand Co., 1933.
9. M. Wunder and B. Janneret, *Compt. rend.*, 152, 1770 (1911).

* Present address, 3353 Ridge Ave., Philadelphia, Pa.

GIFS Holds Casting Design Contest

NATIONWIDE in scope is a casting design contest being conducted by the Gray Iron Founders' Society, Cleveland, and open to all gray iron foundries. The contest is being held to determine the most significant and outstanding example of redesign of a component or part as a casting to replace some other form of construction. Members of the Society's Advertising Committee will judge the contest, which will feature cash prizes to first and second place winners and suitable recognition for all contest entrants.

Prize-winning steel castings. First prize winner (at left) showed proper placing of chills. Gating was questionable but casting was judged to have greater sales appeal than second prize winner (center), which employed blind risers and carbon rod to insure soundness. Both castings made use of pressure to increase soundness. Center casting showed less yield and higher cleaning costs than one at left. Lowest yield and highest cleaning costs of the three was shown by third prize winner (right) which, however, showed properly necked-down risers.

INCREASED ACTIVITY MARKS

Analysis of 27th A.F.S. Contest Entries

Roy W. Schroeder
Chairman
A.F.S. Apprentice Contest Committee

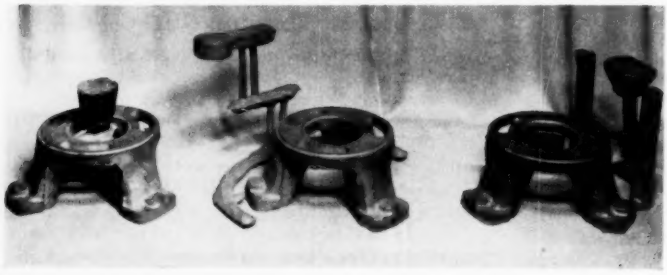
OVERCOMING EARLY INDICATIONS that the number of entries would be below average because of a slackening of industrial activity during the latter part of 1949, the 27th Annual A.F.S. Apprentice Contest had 267 entrants, a number equal to many of the best previous years. Ten chapters of the Society held contests in preparation for the National Judging, as well as many plants throughout the nation.

Of the five Contest divisions, Wood Patternmaking had the largest number of entrants, 114, with Gray Iron Molding, Metal Patternmaking (new this year), Steel Molding and Non-Ferrous Molding following in order of number of entries.

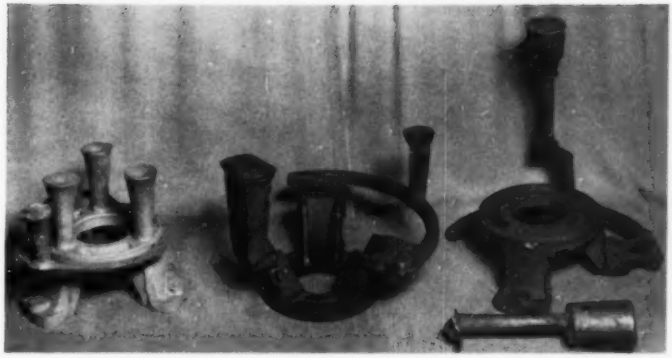
Same Pattern For All Molding Divisions

As in the previous year, the same pattern was used for all Contest molding divisions, a practice which again emphasizes the need for uniformity of molding, gating and risering methods. It was found that there is also room for improvement in methods of teaching apprentices the fundamentals of all phases of foundry

Shown above grouped around center table of Apprentice Contest exhibit at 1950 A.F.S. Foundry Congress & Show are members of the A.F.S. Apprentice Contest Committee. Left to right: E. J. McAfee, Puget Sound Naval Shipyard, Bremerton, Wash.; Vice-Chairman C. W. Morisette, Pennsylvania State College; Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit; Chairman Roy W.



First, second and third place gray iron castings (left to right, respectively) show proper use of facing materials and have well-established parting lines. (Left) High yield, conventionally-gated casting shows use of strainer core, proper cutting of gates. (Center) Step-gated casting shows lower yield. Simpler gating method would have been better. Casting at right had less yield due to risers of doubtful value.



Winning non-ferrous castings. (Left) First prize, aluminum, is clean, has sharp edges and well-established parting lines. (Center) Second prize, bronze. Reverse method of gating and mold making. Skim core and runner in cope insure clean metal. Good grade of sand and proper ramming resulted in a smooth casting. Necked-down riser or Washburn core would cut cleaning cost. (Right) Third prize, bronze. Metal penetration in legs resulted from failure to compensate for high sprue by hard ramming and preparation of facing material.

1950 APPRENTICE CONTEST

Reveals Wide Variance In Foundry Practice

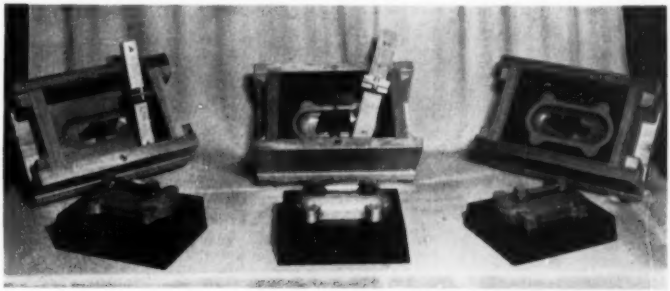
Schroeder, University of Illinois, Navy Pier Branch, Chicago; G. E. Garvey, City Pattern & Foundry Co., South Bend, Ind.; Joseph E. Foster of A.F.S. Headquarters, Chicago; J. A. Havnen, Liquid Carbonic Co., Chicago; L. Gustafson (substituting for James Holzapple), Continental Foundry & Machine Co., East Chicago, Ind.; and F. W. Burgdorfer of Missouri Pattern Works, St. Louis, Mo.

work, particularly proper selection of sands and facings to meet individual job requirements.

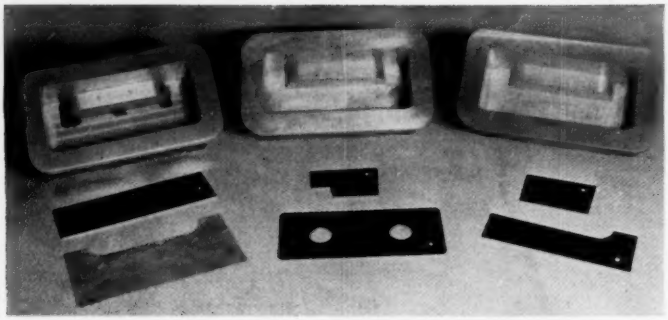
The surface condition of many of the castings entries proved the need for more knowledge on the part of apprentices and more interest on the part of foundry executives in seeing that apprentices receive adequate grounding in foundry fundamentals. Since raw materials are furnished the apprentice, responsibility for rough castings surfaces must be assumed by those furnishing him with poor materials.

This brings up the question "Are we forcing our apprentices and, if so, what are we gaining by it?" The answer is more rough castings today and a possible increase in scrap tomorrow. Inferior workers or workers forced to use inferior materials seldom if ever develop into first-class mechanics or competent supervisory personnel. A little additional time spent on preparation of suitable facing materials or sand conditioning, plus thorough instruction of apprentices, would more than compensate for this time by speeding-up molding operations and cutting cleaning room costs. The result would be cleaner castings.

A question which invariably arises in the selection of the top three winners in each molding division of the Contest is "Which casting would you buy?" Sales appeal of a casting before the cleaning room removes

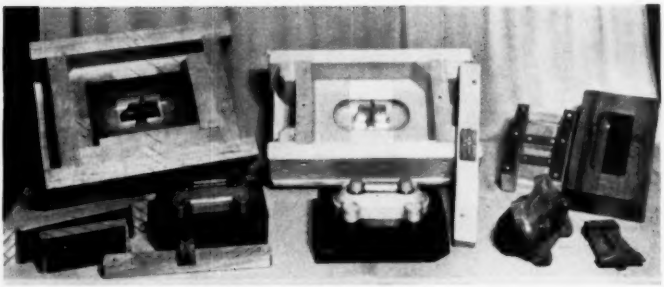


First, second, and third prize winning wood patterns (left to right, respectively) have construction typical of majority of patterns submitted. Use of a register and blocking-off of corners would save core sand and assist in setting of cores. All boxes show good, solid construction and would produce required number of cores without the necessity for additional work on the part of the apprentices.



First, second, and third prize winning metal patterns (left to right, respectively) are shown with templates used by contest division judges, who are all experienced metal patternmakers. Templates aided in eliminating all but most accurate entries. Following a practice established in previous contests, the top seven patterns in both wood and metal are then subject to a second judging.

Wood pattern entries showing (Left) fine workmanship at prohibitive cost. Pro-rated among 50 castings, the 65 hours required to make this pattern would average 1.3 hours per casting. (Center) This pattern was made along most popular lines of construction. (Right) Cores from this box require pasting. This was the only entry in the Contest to provide filing jig to insure accurate core.



fins, burrs and swells is important. The old foundry adage, "A fin is better than a crush," should be replaced by "A properly constructed mold will not crush." Another familiar foundry saying, "Let the hungry iron eat it," should be replaced by "A clean mold insures a sound casting." Loose sand forms holes in castings and these holes may well be located at the most vital junctions of the casting.

National Contest Judging

National Judging of the 27th A.F.S. Apprentice Contest took place April 8 in Cleveland. The judging for each year's Apprentice Contest is held approximately one month prior to the A.F.S. National Convention in the Convention host city. Judges for the Contest are foundry or pattern shop foremen, plant owners or other foundry executives from in or about the Convention host city. There are two or three judges to each division. Each is a recognized expert in the field he has been chosen to judge.

Judges for the 27th A.F.S. National Apprentice Contest, all from the Cleveland area, and their respective divisions are as follows:

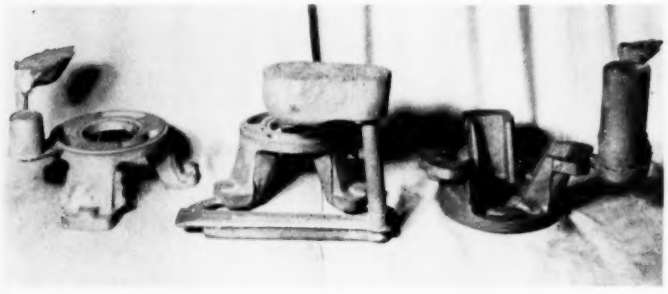
Gray Iron Molding: James G. Goldie, M.B.M. Foundry, Inc., Garfield Heights, Ohio: W. A. Thomas, Bowler Foundry Co., Cleveland; George T. Clifford, Fulton Foundry & Machine Co., Cleveland.

Steel Molding: Louis Klein, Crucible Steel Casting Co., Cleveland; Thomas West, West Steel Casting Co., Cleveland.

Non-Ferrous Molding: John J. Jasso, Wellman Bronze & Aluminum Co., Cleveland; A. H. Hinton, Aluminum Co. of America, Cleveland.

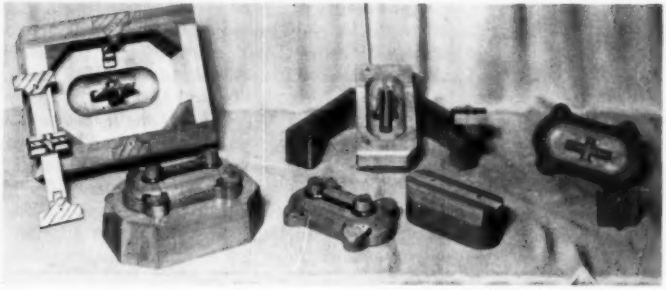
Wood Patternmaking: H. G. Waterfall, John W. Wilbur Co., Cleveland; L. Schmidt, Aluminum Co. of America, Cleveland; Carl Winkler, Cleveland Standard Pattern Works, Inc., Cleveland.

Metal Patternmaking: Peter Rettig, Rettig Pattern Co.; Michael Dolan, Motor Patterns Co.; and C. Wilberscheid, Master Pattern Co., all of Cleveland.



Gray iron entries shown here are examples of poor facings, improper gate construction, and lack of proper ramming. (Left) Note rough pouring basin and heavy fins. Clean castings are impossible if pouring basins are rough and gates are not properly choked. (Center) Pouring basin is too large and swells on leg indicate poor ramming. (Right) Connecting neck has cross-section to small for casting.

Steel castings entries show (left) ➡ sales appeal and low cleaning cost but low yield. Pouring difficulties might result from sprue this straight. Gate construction time and flask size would increase production costs. Use of Washburn cores insures easy removal of risers; (center and right) poor sand conditioning, incorrect positioning of risers. Heavy fins and swells would lower sales appeal of the casting.



⬅ More wood pattern entries. At left is pattern typifying most popular type of construction. Center pattern is of type that would increase casting problems because of feeding of bosses in cope and possibility of draws along center rib of casting. (Right) Lowest time, 10 hours, was credited to this entry. Long, loose piece and short dowels call for careful molding to avoid shifting the center piece.

JUDGES' SCORING SYSTEM

Judging forms are furnished by the A.F.S. National Office through the A.F.S. Apprentice Contest Committee and selection of winning Contest entries is based on the following scoring system:

Gray Iron and Non-Ferrous Molding Divisions

Gates and Risers	45
Cleanability, General Appearance	30
Soundness	15
Time	10
Total	100

Steel Molding Division

Risers	20
Gates	15
Soundness	15
Chills, Nails	10
Cleanability, General Appearance	30
Time	10
Total	100

Wood Patternmaking Division

	Maximum Points
Accuracy according to blueprint	35
Moldability	35
Workmanship	20
Time	10
Total	100

Metal Patternmaking Division

Accuracy according to blueprint	50
Workmanship	40
Time	10
Total	100

For the 1951 Apprentice Contest molding divisions, a drawing showing which casting surfaces are subsequently to be machined will accompany each Contest pattern. Patterns for the molding divisions and castings for the Metal Patternmaking Division are now being made. Drawings for the Wood and Metal Patternmaking Divisions will be ready September 15.

Non-ferrous entries shown here ➡ provide comparison of the high and low yield that can be achieved with different gating systems. At right and left are examples of good gating, while center casting shows low yield, lack of proper facing, and would involve high cleaning cost, as revealed by interior surface of leg in background and by huge risers. Castings at left and center show fins.

DEVELOP GATING FORMULA FOR ALUMINUM ALLOY CASTINGS

Alfred J. Howarth
Foundry Sales
Eclipse-Pioneer Div.
Bendix Aviation Corp.
Teterboro, N. J.

MODERN INDUSTRY DEMANDS quality castings. Non-ferrous foundries, particularly those serving the aircraft industry, are required to produce castings which are free from surface and interior defects. Specifications are rigid, and to meet them the foundryman must use proper equipment and materials, and employ adequate gating, chilling and risering techniques.

Foundrymen have had to revise some of the old-time thinking regarding the gating system only as a means of filling the mold cavity with molten metal. Although the primary purpose of a gating system is to fill the mold cavity, there are other functions which it must perform: (1) fill the mold cavity completely and as rapidly as possible without turbulence; (2) prevent sand, dross and oxide from entering the mold cavity with the molten metal; (3) establish proper temperature gradients in the mold so that the gating system will "feed" the casting during solidification, thereby eliminating to an extent both internal and external shrinkage.

Design Feeding Systems

Certain measures must be taken to accomplish the desired aims. These include: (1) proper location of patterns on the plate; (2) type of runner controlling the metal entering the mold cavity; (3) temperature of the metal; (4) size and location of risers to compensate for volume losses due to unequal cooling during solidification.

Many variables in foundry operations have an adverse effect on the best gating practice. These are: (1) variations in metal temperature; (2) metal composition variations, particularly the bronze and aluminum alloys; (3) pouring operations carelessly performed.

The high production necessary to meet modern competition and the rigid inspection requirements demand an understanding of shrinkage and contraction characteristics during cooling and the direction of solidification in order to apply a sound gating and risering system on production patterns. It is quite necessary in modern foundry practice to make a thorough study of casting requirements before mounting patterns for production.

Location of patterns on a plate is important. The location of multiple patterns on a plate will have a bearing on the size and location of the gates and/or risers and affect the temperature gradients in the mold which, in turn, will affect the direction of solidification.

Gates and risers should be a part of the pattern equipment since their size and location are important in the control of shrinkage and the quality of the casting. Formed or set gates are true to size and shape and are uniform in subsequent molds. Hand-cut gates are not uniform, and this lack of uniformity adds to the number of variables in the casting process.

General foundry practice in the not too distant past was an art, with little science applied in the production of castings. Since the advent of high production, mechanical foundries, the old-time artist or skilled craftsman is slowly disappearing from the scene and science is replacing him to a large extent in the control of sands, gating, risering, metal control and molding methods.

Gating and risering practices seem to have eluded the foundry scientist, as no exact formula for gating various types of castings has as yet been devised. Considerable work on gating problems has been done in this company's foundries and with the knowledge already at hand, more rapid progress is expected. A formula devised over a period of years and providing satisfactory results is as follows:

Size of Gate: The cross-sectional area of the gate at the entrance to the mold cavity should be somewhat larger than the cross-sectional area of the casting wall in order to provide a supply of molten metal to the casting during solidification. This is possible because the gate remains in the fluid state for a longer period than the casting due to the larger cross sectional area.

Width of the gate should be approximately three times the gate thickness. This proportion of width to thickness allows the molten metal to enter the mold cavity quietly and rapidly with minimum turbulence.

Length of the gate should be somewhat larger than

Fig. 1—Three formed risers are permanently fixed to the cope pattern section, and four riser heads match with the gates. Sprue locating pads are also shown.

NOTE: This paper was presented at the Regional Foundry Conference sponsored by the A.F.S. Metropolitan, Philadelphia, and Chesapeake Chapters at Stevens Institute of Technology, Hoboken, N. J., Oct. 21-22, 1949.

the gate width. The gate length will also aid in determining the location of the runner bar, and this in turn will maintain proper temperature gradients in the gate area and feed the casting during solidification.

Number of Gates: in general the spaces between the gates should be approximately twice the width of the gates and this will determine the number of gates to be applied. This general principal may have to be varied on some types of castings due to the design of the casting, or the junction of light and heavy wall sections. The principal objective is to flow the metal into the mold cavity quietly, rapidly and uniformly. This will result in uniformity of metal temperatures in all parts of the mold, and in equal cooling and solidification provided the heavy sections are properly risered and chilled.

Gate Location: On small castings having a drop of 3 or 4 in. from the drag parting line, gates may be placed on the parting line of the casting. On larger castings it is recommended that bottom gating be used to insure best results. Bottom pouring is recommended as it results in a quiet and smooth flow of metal into the mold cavity with minimum turbulence. This method results in lowered scrap losses through elimination of oxidation, pin holes and microshrinkage.

Consider Casting Type

In some cases castings can be gated from one end due to the uniformity of wall thickness, and the principle of controlled directional solidification applied. In a casting of this type the first metal to enter the mold cavity flows to the section farthest from the gate and is therefore the metal with the lowest temperature upon completion of pouring.

The casting solidifies directionally from the point farthest from the gate. During the solidification process the gating system feeds the casting, the last point to set or freeze being the gate provided the proper temperature gradients have been maintained through correct application of the gating system.

Runner: The cross-sectional area of the runner should be approximately 10 per cent larger than the total gate area. This assures an adequate supply of metal to the gates. The runner should be approximately 50 per cent higher than the width of the base and extend into the cope.

In some cases runners are placed in the drag, but this practice should be discouraged so far as possible. The runner in the cope traps oxides and dross in the upper part of the runner as well as feeding molten metal to the gates during solidification. With the runner in the drag floating foreign material will flow into the mold cavity through the gates, which would be on the top of the runner in this case. With the runner in the drag the casting may act as a feeder to the runner during solidification. Flat-back castings or those with shallow projections into cope are examples of this.

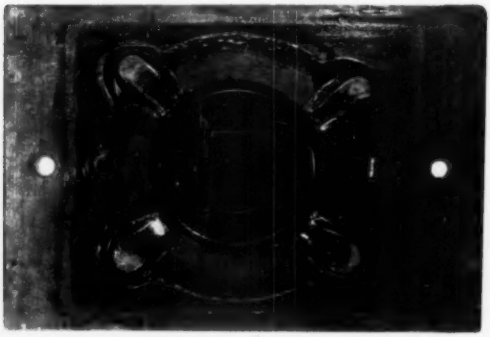


Fig. 2—Down sprues and gates are shown on the drag half of the pattern, the gates passing under the core print. The gate is an adaptation of the horn sprue.

Fig. 3—The as-poured casting shows chill locations, risers for heavy sections, and risers for feeding gates.

Sprue: The cross-sectional area of the sprue should be approximately 50 per cent of the total gate area to reduce the velocity in the gate. While some turbulence may develop during the fall into the sprue, it is dissipated after the metal flows into the runner and eliminated while entering the mold cavity. The sprue may be round, rectangular or oval in shape so long as it provides the proper flow of metal. These different sprue shapes are applied as casting design, flask, pattern equipment and pouring methods require.

Choke: The choke is always at the base of the sprue in the company foundries. This is the rule whether screens are used or not. This practice is followed so that a solid volume of metal is formed from the base of the sprue to the top of the pouring basin. After passing through the choke area and screen the metal flows quietly through the runner and gates with minimum pressure and turbulence.

Screens: It is our practice to use screens on all types of castings where it is felt they will be of benefit, especially on castings requiring a large volume of metal. This is to trap the oxide and fluxes that may flow into the sprue area during pouring. The screen area in use is approximately five times the choke area of the sprue. This increase in area over the sprue is

necessary due to the size of holes in the screen and to compensate for the loss of velocity due to friction.

Pouring Time: Proper pouring speed is important in the production of sound castings in any metal, and is determined by the area, wall thickness and the amount of metal required to fill the mold cavity and gating system. The pouring time should be such that the mold cavity can be filled rapidly without turbulence at a low temperature. The proper pouring speed also aids in eliminating scrap losses through scabs, rat tails, shrinks, misruns, and oxide and dross inclusions. The pouring time required is mostly estimated at present, based on previous experience, and is 4 to 8 lb/sec on small castings and up to 15 lb/sec on large castings.

Risers: The primary function of a riser is to supply molten metal to the casting to compensate for solidification shrinkage. Lack of proper feeding may develop voids within the casting which are not discover-

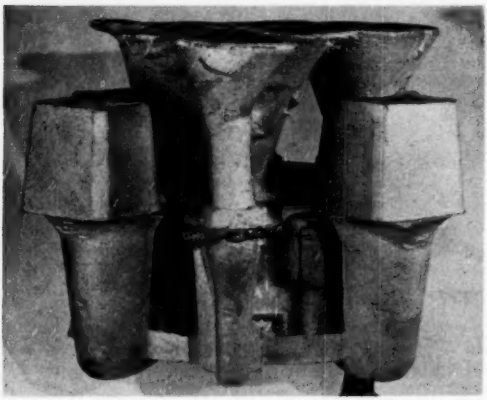


Fig. 4—A cope view of the casting illustrates the use of two types of risers for shrinkage control, and pouring through a riser. After the gates have solidified hot metal is added to the three center risers.

able until the casting is subjected to a pressure test or x-ray. To be effective the riser must be properly sized and located. Obviously, if the riser neck or the area attached to the casting is too small it cannot perform its function due to setting or freezing too quickly. The neck of the riser should remain in the molten state for a longer period of time than the parent casting if it is to function properly and control shrinkage.

Risers may be of various shapes and sizes, depending on the area to be fed. They may be either open or blind for the same reasons. The location of the riser will also depend on the section to be fed, and can be located on the top or side of the casting, or be a part of the gating system.

Wherever possible it is recommended that they be placed on the runner over the gate adjacent to the area requiring feeding. This system provides for pouring through the riser and filling the riser with hot metal after filling the mold cavity. This provides the hottest metal in the riser without "touching up" and keeps the feed gate open for a longer period during solidification. It is imperative that the gate be short and of sufficient size to remain molten and allow the riser to feed. Good risering practice in regard to size and location also depends upon a knowledge of the principles of shrinkage and solidification.

At present on many of our large castings the method of arranging a gating system is: when starting to produce a casting from a blueprint the foundry superintendent, pattern engineer and foundry foreman study the print and determine the type of equipment necessary, and plan the location of the pattern so that an effective gating system can be adopted. Upon receiving the pattern the location of the gates is determined for the most effective distribution of molten metal. Areas to be chilled and risered are also determined at this session to coordinate them with the gating practice.

The weight of the casting is also estimated and a pouring time also determined. This information is passed to the metallurgical department where gate, runner, screen, and sprue areas are determined to provide the required flow of metal at a given temperature. This method has produced excellent results on many castings on the first try; some others have had to be readjusted to compensate for unforeseen temperature gradients in the casting.

The most perfect gating system will not produce

TABLE 1—RESULTS OBTAINED IN GATING EXPERIMENTS

Data from the Foundry

Exp. No.	Alloy	Height of Sprue, in.	No. of Sprues	No. of Gates	Estimated Pour Wt. lb	Required Time, sec
1.	56	11	2	8	54	15
2.	15A	12	1	8	48	20
3.	56	7	2	4	35	10
4.	15A	15	2	4	140	30
5.	15A	7	2	10	90	30
6.	15A	9	2	4	72	20
7.	15A	15	1	2	50	25

Areas and Velocities Calculated from Above Data

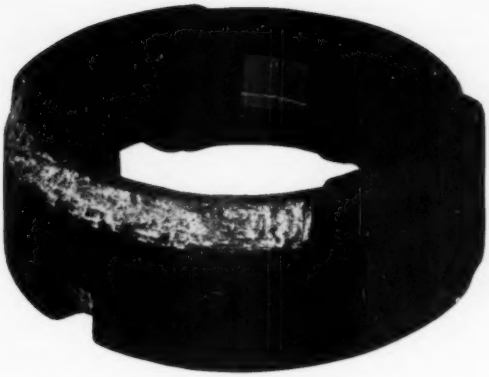
Exp. No.	Velocity at Bottom of sprue, in./sec	Velocity in Gate, in. sec	Avg. Quantity Metal/sec, lb	Calculated Time, sec
1.	92	18	4	15
2.	96.5	18	3	18
3.	73.5	12	4	10
4.	108	16.2	4	30
5.	74	13	3.5	31
6.	83.8	12	3.2	22
7.	107.5	16	2.2	22

Actual Results

Exp. No.	X-Ray	Actual Poured Weight, lb	Actual Time, sec
1.	O. K.	57	14
2.	O. K.	50	18
3.	O. K.	45	13
4.	O. K.	140	35
5.	O. K.	90	27
6.	O. K.	56	18
7.	O. K.	50	27

Gating Areas

Exp. No.	One Sprue Area, in.	One Runner Area, in.	One Gate Area, in.
1.	2 x 5/16	3/4 x 1 1/4 x 2 13/32	2 1/2 x 5/16
2.	2 x 5/16	5/8 x 1 5/8 x 2 1/4	2 1/4 x 7/32
3.	2 x 5/16	3/4 x 1 1/4 x 2 1/2	5 x 5/16
4.	2 1/4 x 1/4	7/8 x 1 1/2 x 2 1/2	3 1/2 x 5/16
5.	2 5/16 x 1/4	3/4 x 5/8 x 2	1 3/4 x 3/8
6.	2 1/16 x 9/32	1/4 x 3/4 x 2 1/4	4 x 1/4



Figs. 5 (left) and 6 (above)—The chilling arrangements shown in the cores were developed to secure the required casting quality. Fig. 5 shows the runner bar, and one half of the screen area section (lower left).

a good casting by itself. All other foundry operations involved in producing a quality casting must be controlled. These operations include melting, molding (mold hardness, moisture, permeability and molding sand additions), pouring operations, and core making through each of its cycles. Supervisors must be alert to detect and correct any deviation from the standard practices established by the engineers and metallurgists and proved practicable in actual foundry operations. The accuracy attained in experiments with scientific gating is shown in Table 1.

As an example of planned gating and risering systems, incorporating some of the principles described, the accompanying photographs illustrate production of a casting subject to rigid inspection requirements—x-ray and fluorescent penetrant. This casting is made on a production basis using a mahogany match plate board with fixed gates and risers. The runner bars are in the core box and sprues, gates and risers are in green sand. Other pertinent data are shown in Table 2.

Figure 1 shows the cope section of the pattern with three formed risers permanently fixed to the pattern on the heavy sections of the casting, and four riser heads to match with the gates entering the mold cavity. Permanent sprues were not attached due to lack of room for the ramming operation. Pads for locating the sprues, which are punched, are also shown. The casting is poured two-up to provide equal temperature gradients in the mold, thereby eliminating any hot spots.

Figure 2 shows the drag half of the pattern with the down sprues and gates. The gates pass under the core print and the casting is poured from the bottom.

TABLE 2—ALUMINUM CASTING PRODUCTION DATA

Flask size, in.	
Cope	14 x 16 x 5
Drag	14 x 16 x 5½
Molding sand	No. 1½ Albany
Mold hardness	35-40
Aluminum alloy	No. 195
Estimated pouring time, sec	10-12
Actual pouring time (two-up), sec	13
Pouring temperature, F	1300
Total poured weight, lb	37
Finished casting weight, lb	10

The gate in this case is an adaptation of the horn sprue.

Figure 3 shows the as-poured casting with the locations of chills, the heavy sections of the casting risered, and the risers for feeding the gates. The areas of sprue and gates on each side are: sprue, 0.7854 sq. in.; screen area, 2.4053 sq. in. (in a magnesium alloy this would be approx. 3.1416 sq. in.); choke area, 0.6013 sq. in. The gate measurements are: width, 1½ in.; length from casting to back of runner bar, 1 in.; thickness, ½ in.; distance of runner bar from casting, ½ in.; width between gates, 5½ in.; total gate area approx. 1.5 in. Runner bar dimensions are 1 x ½ in. This may not appear to conform to the text but due to lack of space in the flask the runner bar was made the controlling factor in the pouring speed, and the turbulence is dissipated in the gate area before entering the mold cavity.

In Fig. 4 the cope side of the casting is shown with the risers over the gates, and the piping or feeding taking place during solidification. This is an illustration of pouring through a riser. The three center risers are reamed out and "touched up" with hot metal after the gates have solidified. The riser sizes over the gates are 2½ x 3 in. at the base of the cope

Fig. 7—The finished rough casting weighs 10 lb—poured weight, 37 lb. The low yield is due to the amount of risering necessary to obtain the required quality.

section, and tapered to approximately 2 x 1¼ in. at the gate, thus providing for satisfactory feeding.

The three center risers are also shaped to the casting contour at the base; each is 1½ in. thick at the base and follows the contour of the heavy section of the casting. This risering arrangement is a good example of using two types of risering for effective shrinkage control.

Figures 5 and 6 show the chilling arrangement in the cores which is necessary to produce the required quality in this casting. Also shown in Fig. 5 is the runner bar, and one half of the screen area section in the lower left-hand corner.

The finished rough casting after inspection is shown in Fig. 7. The difference between the cast weight and finished casting weight may seem high to many foundrymen, and would be on many classes of work. In this case it is absolutely necessary to obtain the required quality. The rejections on this part are very low, and in all cases are caused by the operator.

ALL-CANADIAN CONFERENCE SEPTEMBER 28-30

FIRST REGIONAL foundry meeting of 1950-51 is the All-Canadian Conference to be held at the Royal Connaught Hotel, Hamilton, Ont., Can., September 28, 29, and 30. Following closely are the Texas Regional at the Plaza Hotel, San Antonio, October 5 and 6, and the Pacific Northwest Regional, October 13 and 14 at the Gowman Hotel in Seattle, and at the University of Washington.

R. H. Williams

The Metals Castings Conference at Purdue University, West Lafayette, Ind., November 2 and 3, and the Michigan Regional Foundry Conference at Michigan State College, East Lansing, Mich., November 10 and 11 complete the round of late 1950 regional meetings sponsored by A.F.S. chapters.

Program for the Third A.F.S. All-Canadian Conference announced by Conference Chairman R. H. Williams, Canadian Westinghouse Co., Ltd., Hamilton, includes a two and one-half day sand course, technical sessions for ferrous and non-ferrous foundrymen, plant visitations, and a banquet with an outstanding humorist and philosopher as speaker.

Headquarters for the conference will be at the Royal Connaught Hotel where all sessions will be held. Program details follow:

Thursday, September 28

9:00 a.m.—REGISTRATION.
9:30-12:00 a.m.—SAND COURSE; directed by Harry W. Dietert, Harry W. Dietert Co., Detroit.
12:30 p.m.—LUNCHEON.
2:00 p.m.—PLANT VISITS.
SAND COURSE.
6:30 p.m.—BANQUET.
8:00 p.m.—SPEAKER: Bruce L. Simpson, National Engineering Co., Chicago.

Friday, September 29

9:00-12:00 a.m.—SAND COURSE.
10:00-12:00 a.m.—PLANT VISITS.
2:00 p.m.—SAND COURSE.
TECHNICAL SESSIONS: Ferrous and Non-ferrous.
6:00 p.m.—RECEPTION.
7:00 p.m.—BANQUET.
8:00 p.m.—SPEAKER: E. A. McFaul, Chicago.
9:00 p.m.—ENTERTAINMENT.

Saturday, September 30

9:00-12:00 a.m.—SAND COURSE.

James R. Hewitt, Houston, chairman of the Texas Regional Foundry Conference has announced a change in schedule with dates now set for October 5 and 6 instead of two weeks later as formerly reported. Sponsors of the Texas Regional are the Texas Chapter and the Texas A. & M. Student Chapter. Program details are scheduled to be announced in the September issue of AMERICAN FOUNDRYMAN.

Features of the Third Annual Metals Casting Conference include discussions of recent engineering developments in the foundry industry and a talk on casting design which will emphasize relationships between design and production methods. This conference is again under the sponsorship of the Central Indiana and Michiana Chapters, and Purdue University, and will be held on the Purdue campus at West Lafayette, Ind., November 2 and 3. L. L. Andrus, American Wheelabrator & Equipment Corp., Mishawaka, Ind., is chairman; Prof. C. T. Marek, Purdue, is vice-chairman. October issue of AMERICAN FOUNDRYMAN will carry the full program.

Urge Return of *Transactions* Order Forms Not Later Than September 30

PRE-PUBLICATION ORDER FORMS for the 1950 bound volume of A.F.S. TRANSACTIONS, volume 58, should be returned prior to September 30 by all Society members interested in taking advantage of the special price of $6.00. Remittance should accompany order. Published again as a limited edition, the cloth-bound volume will contain all the technical papers and discussion presented at the 1950 A.F.S. Convention, exchange papers with foundry organizations of other countries, reports on Society-sponsored research projects, committee reports and surveys, and the business transactions of A.F.S. for the fiscal year just ended.

TRANSACTIONS is offered to Society members only at the low pre-publication rate. After September 30 the member price will be $8.00. Non-member price at all times is $15.00.

Sustaining and honorary members, on record as of the date of publication, receive one copy gratis on request. A special form was mailed July 15.

Pre-publication order forms for this year's TRANSACTIONS, which will include some 75 papers covering over 650 pages, were sent to all members on July 15. The form, properly filled in and accompanied by $6.00, should be mailed to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill., in time to arrive not later than September 30.

A CUBAN TRAINEE Looks At U.S. Patternmaking

Luis Mojicar
Patternmaking Trainee
International Training Program
U. S. Bureau of Apprenticeship

TWENTY-ONE-YEAR-OLD Luis Mojicar of Havana, Cuba, was the first patternmaking apprentice selected to receive training in United States foundries and pattern shops under the U. S. Bureau of Apprentices' International Training Program. A graduate of the Cuban Government's Industrial and Technical School, where he won a competitive scholarship in foundry practice, Mojicar was employed as an apprentice patternmaker in a Havana foundry when he was chosen an International Trainee by the U. S. Bureau of Apprentices.

Since coming to the United States last September, he has completed an 11-months' training program in foundries and pattern shops of the St. Louis area, including the Central Pattern Co., American Steel Foundries, Missouri Pattern Works, Key Co., National Bearing Division of American Brake Shoe Co., Fulton Iron Works, and Scullin Steel Co.

The following is his chronological account of two months of this training period, spent with American Steel Foundries, Granite City, Ill.:

February 1 to February 15—I was transferred here yesterday from the Central Pattern Co. This is the first time I have had the opportunity to witness the making of steel castings and the methods, equipment, and foundry practices pertaining thereto. This foundry differs from the small aluminum and brass foundry at the Central Pattern Co. inasmuch as this foundry makes steel castings weighing up to several tons. Although this foundry's work is composed mostly of casting railway equipment, it does some general casting work as well.

I was highly impressed by the way these large castings are molded, and the equipment used therefor. This is the first time I have had an opportunity to see a sandslinger in use, as well as a very large shakeout machine. I was also impressed by the size of the cores used in making these castings.

The pattern shop differs from the one at Central Pattern Co. in that special machinery is used in making patterns for railroad side frames and bolsters.

During the time covered by this report, I mounted and gated dead-lever lug patterns on boards for molding in the foundry. I changed the design of a pattern of an old-style brake beam bracket to conform with revised templates.

I also changed the core boxes for these patterns to conform with said templates. The thing that has been outstanding in my work in this shop is that the patterns are made from templates made by layout men and not from drawings furnished the individual patternmakers. The templates are then filed and any future replacement or repair can be made in exact duplicate from the original templates.

February 16 to February 28—During the past two weeks, my activities in the American Steel Pattern Shop consisted of working on patterns for railroad equipment. Types of patterns I have worked on include Vulcan side-frames, double-truss trucks, box-section trucks, and a new-type bolster. My training here has offered me my first opportunity to see how these castings are made and to observe the pattern construction involved therein, which greatly differs from construction methods employed in small pattern work, such as is practiced in the foundry where I was employed in Cuba and at the Central Pattern Co.

The thing that impressed me most is that to obtain these castings, molds are made to conform to cores instead of the actual pattern shape, as in the case of molding aluminum and brass castings, wherein the pattern is contained within the core boxes.

Observes Coremaking Practices

I was also impressed by the fact that in making patterns for steel castings, the core prints are made much larger than those on patterns for aluminum and brass castings. I also learned the method of making the inside of a core hollow, so that when the metal cools the sand core will be able to shrink in accordance with the metal and not damage the casting.

A great impression has been made upon me by the foundry practices used in making certain pattern parts. For instance, in the molding of a side-frame brake hanger bracket, the bracket is at an angle on the pattern, although it is perpendicular on the finished casting. The ways in which patterns are constructed and designed to overcome the shrinking and drawing of metal impressed me very much.

During this period, I also made a layout of the column box on a side frame, in order to familiarize myself with drawings used in this type of work.

As part of my training with this company, I will spend part of my time in the foundry, working with

International Trainee Luis Mojicar at work finishing a core box in American Steel Foundries' Pattern Shop.

molders, coremakers, casting cleaning department men, and inspection men. For the last two days of this period, I have worked entirely in the foundry, more or less familiarizing myself with the machinery, equipment and plant layout.

I was very much impressed by the way the internal cavities on some of these large castings are made using numerous cores put together like a jigsaw puzzle—instead of using just one core as is customarily done in small casting work. This impressed upon me the importance of being exact in dimensional work in constructing patterns.

March 1 to March 15—Last week I spent two days in the foundry's core rooms, seeing how they make different types of cores by hand and on various blow machines. The method employed in making cores is quite different from the methods previously explained to me in the making of cores for aluminum and brass castings, the main difference being the formula from which the core sands are made. It was quite interesting to me, viewing the ingredients that went into these core sands.

I am sure that this information, along with the information I have gained regarding plant layout, molding methods, etc., will be of great value to me in future years in Cuba.

Learns Time and Motion Principles

I also spent part of my time on a moderate form of time and motion study—why two men machines and two men are used to make molds for one casting. I have learned that by having two men work on the molds, one on cope and one on drag, 175 molds can be produced in a day; whereas if only one man made both molds, less than 100 molds per day could be made.

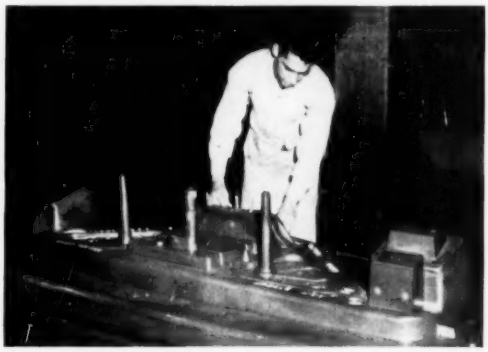
Various men in the foundry have spent time with me in order to explain various operations in constructing molds both from green and dry sand. Methods employed in using dry sand molds will be of great benefit to me in future years.

For the largest part of this period I have been in the plant's pattern shop, working on different types of patterns for the plant's foundry. To name a few I worked on: transom for Barber stabilized swing motion truck, side-frame for full-cushion truck, pig mold patterns (mounted on board), repairing core boxes for bolster, pattern for duplicating machine to machine metal side-frame pattern, and motor housing patterns for experimental work.

During the past few days I have been working on a pattern to be used in a duplicator machine. This is quite interesting, as I followed my pattern from my bench to the machine shop, back to the pattern shop, where it was finished by filing and scraping by metal patternmakers and back again to the machine shop, where duplicate patterns were made. This is my first experience in seeing such a machine in use.

March 16 to March 31—During this period my training has been in the foundry. I have followed operations in the pattern shop, on the molding floor, in the core room, the furnace floor, the cleaning room, etc.

I paid particular attention to the ways and means by which various castings were made; how patterns were constructed in order to achieve the required castings; the way cores are made and what they consist of; types of steel alloys used and what materials went into making up these alloys, and why these various alloys



Luis Mojicar checks cope pattern for railroad truck side frame in American Steel Foundries' Molding Dept.

were required. All of this information was given me very thoroughly by various departmental heads and foundry employees.

The following is a very brief summary of some of the things I have learned about the steel industry while at American Steel Foundries:

Side Frames and Bolsters: Molds are made in a push-up machine by sandslinger, drag and cope. Molds (drag) are conveyed to a line where cores are set. Each man has his special core to set with gages. Cores consist of half dry cores and half green sand cores. After setting the cores in the drag half, the molds are closed with the cope and moved by conveyors to pouring floor.

Motor Housing Spider and Generator: These molds are molded in a stripper and push-up machine by sandslinger. The patterns for these molds are of wood covered with $\frac{1}{8}$ in. metal (brass or iron) to protect them from wear. After this, molds are carried by crane to

where special cores are set with gages. These cores consist of dry sand and require great skill to set in the molds, in order to get the metal thickness required.

Core Room: This is divided into separate sections; one where cores are made for side frames and bolsters; and the other where big cores are made for motor housings, spider, and generator parts. In the first, a coreblowing machine is used, or cores are made in aluminum core boxes, by hand on core benches, or by a hand rollover machine.

Cast Chill: Horseshoe nails are used in the cores. Core wash is then sprayed on to make smooth, clear castings. Both old and new sands are used, along with oil, cereal binders, synthetic and natural resin binders, silica flour, and zirconite sand. When cores are finished, they are set in racks and carried to the oven, where they are dried, and then to the foundry by lift-truck. For handling heavy cores one-ton hoists are used.

Furnace Floor: This floor consists of three furnaces and a charging machine. Materials consist of pig iron and scrap, with additions of iron ore, fluorspar, 15 per cent and 50 per cent ferrosilicon, aluminum, burnt dolomite, spiegel, ferrochrome, petroleum coke, ferrotitanium, and magnesite. Metal is then analyzed for carbon content.

Sample Room: Castings are set-up on a surface plate to be checked against blueprints, to find if castings come within tolerances allowed. Here checks are made for cracks and casting defects.

Mass Production Unknown in Cuba

Although many of the procedures mentioned may seem irrelevant to the patternmaker's work, they will be of great benefit to me and to my employer in Cuba, since mass production methods are unknown in the steel foundries there.

This report only partially covers the 11 months I have spent in United States foundries and pattern shops. During my stay every effort has been put forth by patternmakers and foundrymen of the St. Louis area to see that the objectives of my training program were fulfilled. I am particularly indebted to F. W. Burgdorfer, Missouri Pattern Works, St. Louis, and members of the St. Louis Patternmakers' Joint Apprenticeship Committee, who established a plan of trade orientation whereby I received training in several pattern shops, core rooms, molding floors, furnace floors, cleaning rooms and laboratories in the St. Louis area.

Top Technical Men Offer Assistance

I was particularly impressed by the number of top technical men who spent a great deal of their time and efforts in helping me obtain the greatest possible working knowledge of the United States foundry industry in the short time allotted me.

Among the privileges I have been accorded during my stay in the United States is acceptance as a student member of the American Foundrymen's Society and attendance at the 54th A.F.S. Foundry Congress & Show in Cleveland last May. I was also given opportunity to participate unofficially in the 1950 A.F.S. Apprentice Contest's Wood Patternmaking Division, testing my skill and knowledge against that of the best wood patternmaking apprentices in the St. Louis area.

I know that my association with the many departments of the foundry industry in the United States and my thorough indoctrination therein will prove of immeasurable value in future years. I will take back to Cuba with me the knowledge that it is not by accident that the United States has the finest foundry industry on Earth—it is the result of a fine spirit of cooperation between industry, labor, and Government.

British Columbia Chapter Presents Plaques To Its Meeting Speakers

A HANDSOME BRONZE PLAQUE, designed and cast by members of the A.F.S. British Columbia Chapter, is being awarded by the chapter to speakers at each of its technical meetings as a token of appreciation. Cast in the form of a shield, the plaque features a bas-relief of a totem pole.

First of these plaques were presented to A.F.S. Technical Director S. C. Massari, Ralph L. Lee of General

Motors Institute, Detroit, and W. W. Levi, Lynchburg Foundry Co., Radford, Va., all of whom spoke at British Columbia Chapter meetings during the past year. Presentations were made during the 54th A.F.S. Foundry Congress and Show in Cleveland last May by Chapter Chairman J. A. Dickson, Dickson Foundry Co., Vancouver.

French Foundry Association Elects

OFFICERS for 1950-51 of the French Foundry Technical Association (Association Technique de Fonderie), Paris, France have just been announced for the president by the Association's Administrative Secretary Roger DelPuech. They are: *president*, Daniel Waeles; *vice-president*, Paul Muguet; *general secretary*, Andre Debar; and *treasurer*, Henri Prevost.

SILICA SANDS—SIEVE ANALYSES

A. I. Krynitsky
and
F. W. Raring
National Bureau of Standards
Washington, D. C.

Preprint No. 51-1: First paper to be scheduled for the 1951 A.F.S. Convention to be held in Buffalo, April 23-26, is printed here to facilitate discussion and to broaden the value of the paper to the foundry industry. Written discussion is solicited for publication in AMERICAN FOUNDRYMAN and presentation along with the paper at the 55th Annual A.F.S. Convention. Discussion may be directed to S. C. Massari, Technical Director, American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Illinois.

A STUDY OF SIEVE ANALYSES of silica sand was undertaken to determine the precision of the American Foundrymen's Society fineness test for foundry sands. The primary purpose of the investigation was to determine whether the type of sieve shaker used has any significant effect on the analytical results for a given sample, and the reproducibility of a sampling technique.

The effect of various factors on the results of particle size determinations made by means of sieving tests has been investigated and the results described in several publications. Shergold[1] investigated the effect of sample size and has made recommendations which were adopted in the most recent British standard method for sieve analysis.

Mörtsell[2] has reported on a series of experiments involving types of sieves, sample size and sieving time effects, comparative tests with different types of sieve shakers, and reproducibility of sieve analyses. Fahrenwald and Stockdale[3] investigated the relative efficiencies of several types of sieve shakers, and Swinford[4] has presented a statistical treatment of data obtained with vibratory and rotary type sieve shakers. For further details see FOUNDRY SAND TESTING HANDBOOK, 1944 ed., published by American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

Materials and Testing Techniques

The sand used in the experiments was a washed New Jersey silica sand with an A.F.S. fineness of about 70 and with a particle size distribution (average percentage retained on different sieves) as indicated in Table 1.

The A.F.S. fineness number is obtained by using the standard A.F.S. set of 11 sieves. It is computed by multiplying each weight fraction percentage by a factor, adding the products and dividing the total product by the total percentage of retained sand particles on the different sieves. The multiplying factors are as follows:

U. S. Series Sieve No.	Multiplier	U. S. Series Sieve No.	Multiplier
6	3	70	50
12	5	100	70
20	10	140	100
30	20	200	140
40	30	270	200
50	40	Pan	300

A 5000-gram batch of this sand was prepared by drying at room temperature for 18 hr, passing through a No. 8 sieve six times and through a riffle eight times in order to mix the sample thoroughly. The sand was then spread on a sheet of glossy paper to a thickness of about one inch and covered to prevent dust accumulation. Samples were drawn with a spatula in such a way that each sample represented many sections of the heap. Sample size was fixed at 50 grams and all samples were dried at 105 C prior to analyzing. Although this sampling procedure was used for the convenience of the authors it is recognized that it may not be the most accurate reducing procedure.

One set of sieves was used in all cases, sieving time was fixed at 15 min, and techniques followed in collecting sieve fractions were kept constant throughout. One extra precaution was to place the empty sieves in the sieve shaker prior to every analysis, subject them to a 15-min period of shaking, and remove any particles knocked loose. It was reasoned that this precaution would minimize sample contamination from partially blinded sieves.

Two commonly-used types of sieve shakers were used in the experiments: type (A) sieve shaker accomplishes sieving action by eccentric rotation and tapping. The nest of sieves is rotated at the rate of 285 rpm and tapped at the rate of 150 blows per min. This apparatus is driven by a ¼-hp motor to which both the tapper and rotating shaft are geared, and is controlled by an automatic time switch. Type (B) shaker (Fig. 1) consists of a suspended wooden framework into which the nest of sieves is clamped, and with a 1/6-hp motor mounted on top. The motor drives an unbalanced wheel at the rate of 860 rpm, which causes oscillation of the entire assembly and sets in motion tappers mounted on the sides.

Difficulty was at first encountered with this apparatus in that the individual sieves tended to rotate relative to each other while the shaker was in operation. The result was that metallic particles were ground from the contacting surfaces of the sieves; these particles entered the sample and, being very fine, were retained on the No. 270 sieve or the pan. This source of error was eliminated by bracing the nest of sieves with an aluminum strip (Fig. 2) which did not interfere with the operation of the apparatus but held the sieves in the same relative positions.

Procedure and Results

The reproducibility of the sampling technique employed was determined by analyzing 16 samples and applying statistical methods to the interpretation of the data. These samples were drawn one at a time without mixing the batch between drawings. The analyses were made with a type (A) sieve shaker and the data are tabulated (Table 1) in terms of both A.F.S. fineness numbers and percentages retained on the individual sieves.

The A.F.S. fineness number system of describing

the particle sizes present in a sand has been criticized because of the wide latitude of particle size distributions possible with any one specific fineness number. This shortcoming is of no importance in this investigation, however, because all samples were of the same type of sand and were as nearly alike as the sampling technique permitted. The A.F.S. fineness number system is used in this study because it is a convenient method of epitomizing groups of data and simplifying their interpretation.

The method used in the interpretation of the data can be briefly explained as follows: Indeterminate errors are of varying magnitude for a series of observations. The positive errors, reckoned from the mean or average for the series, must balance the negative errors and the algebraic sum of all deviations from the average is zero. The limits of these errors and the frequency of occurrence of an error of given magnitude can be determined with the data from a few observations in terms of the standard deviation of the entire series from the mean or average value. The standard deviation can be expressed mathematically as follows:

$$\sigma = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \ldots + (x_n - \bar{x})^2}{N - 1}}$$

where σ = standard deviation

$\bar{x}$ = average or mean value of all observations

x_1, x_2, x_3, x_n = values of individual observations

N = number of observations.

According to accepted statistical methods the limits of a large number of subsequent observations, made in the same way, in terms of the standard deviation are $\bar{x} \pm \sigma$ for 68.3 per cent of all observations, $\bar{x} \pm 2\sigma$ for 95.6 per cent of all observations, and $\bar{x} \pm 3\sigma$ for 99.7 per cent of all observations. A complete explanation of the method used here can be found in a standard text on statistics such as Simon[5].

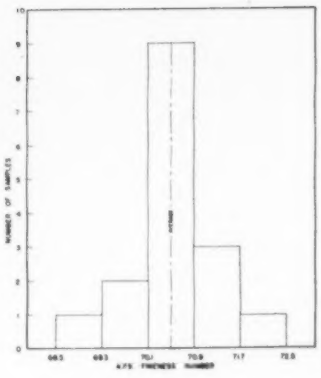


Fig. 3—Histogram showing the grouping of A.F.S. fineness number determination experimental data about their average. Analyses were made with type (A) sieve shaker.

Data obtained in the experiments (Table 1) yield an average A.F.S. fineness number of 70.5. The standard deviation from this average calculated from the formula above is 0.8.

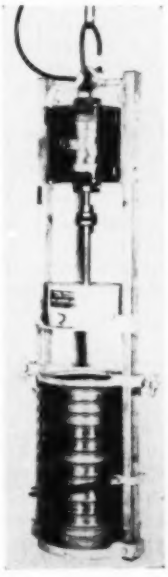
By the process outlined in the foregoing the limits of a large number of subsequent analyses made by the same procedure are as follows:

Limits	Percentage of Total
$\bar{x} \pm \sigma$ or 70.5 ± 0.8	68.3
$\bar{x} \pm 2\sigma$ or 70.5 ± 1.6	95.6
$\bar{x} \pm 3\sigma$ or 70.5 ± 2.4	99.7

For practical purposes the largest error which can be expected is therefore $\pm$ 2.4 A.F.S. fineness numbers or $\pm$ 3.4 per cent. This error is due to both sampling and sieving. It should be emphasized that these limits apply when sigma is estimated from a large number of observations and strict adherence to them cannot be expected. The histogram (Fig. 3) of A.F.S. fineness number versus frequency shows the grouping of the experimental data (type A shaker) about its average.

Table 1 -- Data on 16 Samples Analyzed With a Type "A" Sieve Shaker

Sample No.	Retained on U. S. Sieve, per cent										A.F.S. Fineness Number
	No. 20	No. 30	No. 40	No. 50	No. 70	No. 100	No. 140	No. 200	No. 270	Pan	
18	0.0	0.4	2.0	8.5	34.8	33.3	13.8	4.5	1.3	0.9	70.5
19	0.1	0.3	1.9	8.6	34.8	33.8	14.1	4.3	1.4	0.9	70.6
20	0.0	0.3	2.1	8.6	34.2	33.6	14.1	4.6	1.5	1.1	71.5
21	0.1	0.3	2.0	8.5	33.4	34.7	14.4	4.5	1.3	1.0	71.1
22	0.1	0.3	2.0	8.9	34.1	34.1	13.9	4.2	1.2	0.9	70.2
23	0.0	0.4	2.3	9.6	35.8	33.0	13.2	3.9	1.2	0.8	69.0
24	0.1	0.3	1.7	7.6	33.0	34.7	15.4	4.8	1.5	1.0	72.5
25	0.1	0.3	1.8	8.4	33.8	34.2	14.3	4.6	1.4	1.0	71.4
26	0.1	0.4	2.1	8.6	34.5	33.7	14.1	4.2	1.3	0.9	70.4
27	0.1	0.4	2.0	8.7	35.0	33.6	13.8	4.3	1.3	0.9	70.3
28	0.1	0.4	2.1	8.9	34.5	33.8	14.0	4.1	1.3	0.9	70.2
29	0.1	0.4	2.1	8.7	34.2	34.1	14.1	4.2	1.2	0.9	70.2
30	0.1	0.3	1.9	8.7	34.3	34.1	14.1	4.4	1.3	0.9	70.6
31	0.1	0.3	2.0	8.9	35.3	33.8	13.4	4.2	1.2	0.8	69.6
32	0.1	0.3	2.0	9.0	34.9	33.6	13.7	4.3	1.3	0.9	70.2
33	0.0	0.4	2.1	9.0	35.4	33.4	13.4	4.1	1.3	0.8	69.6



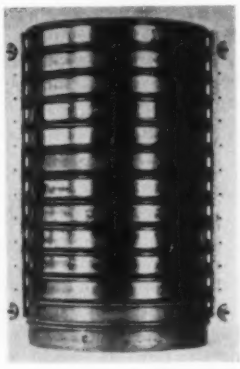


Fig. 1 (left)—Type (B) sieve shaker showing method of suspension and set of sieves in place. Fig. 2 (below)—Nest of half-height sieves and the bracing arrangement used to prevent turning of sieves during operation.

Table 2 -- Data on Repeated Analyses of One Sample with Type (A) Sieve Shaker

U. S. Sieve No.	Analysis Number				
	1	2	4	5	6
	Per Cent Retained				
20	0.0	0.0	0.0	0.0	0.0
30	0.4	0.3	0.3	0.3	0.3
40	2.0	1.9	2.1	1.9	2.0
50	8.5	8.5	8.6	8.6	8.5
70	34.8	34.6	33.8	34.0	33.7
100	33.3	34.1	34.2	33.9	34.3
140	13.8	13.8	14.3	14.5	14.4
200	4.5	4.4	4.4	4.4	4.4
270	1.3	1.4	1.4	1.4	1.4
Pan	0.9	0.9	0.9	0.9	0.9
A. F. S. Fineness No.	70.5	70.7	70.9	71.0	71.1

NOTE: There was reason to believe that the results of analysis No. 3 were erratic. Therefore, they were not taken into consideration.

The process followed in checking the error introduced by the sieve shaker was to make repeated analyses of one sample and check the reproducibility. The data of this test are presented in Table 2. One sample was analyzed six times using the type (A) sieve shaker. The results obtained give some indication that there is a very slight increase in the fineness number of the sample with each analysis. When this relation was plotted (A.F.S. fineness number versus analysis number) and the displacements of the points from this curve were used to compute an approximate standard deviation it was found that an approximate maximum error of the type (A) apparatus is ± 0.4 per cent.

This error may be subtracted from the error due to both sampling and sieving to obtain the error due to sampling alone. According to statistical theory the squares of the deviations are additive; therefore, the error due to sampling alone equals $\pm \sqrt{3.4^2 - 0.4^2} = \pm 3.4$ per cent. The sampling error is thus seen to be by far the largest error for these particular test conditions.

The calculation of the standard deviation in this case is made on the basis of statistical theory described by G. W. Snedecor[6]:

$$\sigma = \sqrt{\frac{\Sigma (x - x^1)^2}{N - 2}}$$

where σ = standard deviation

x = actual fineness number determined

x^1 = assumed true fineness number as determined from the curve.

N = number of determinations.

This method is employed because of the added variable of prolonged sieving. The summation of the squares is divided by $(N - 2)$ rather than $(N - 1)$ for reasons explained in the reference. The standard deviation as calculated from the data is 0.1 A.F.S. fineness numbers. It has already been mentioned that according to statistical methods for practical purposes the largest error of determinations may be accepted as being equal to $\pm 3\sigma$. Accordingly this error of type (A) apparatus is $\pm 3 \times 0.1 = \pm 0.3$ fineness numbers, i.e., approximately ± 0.4 per cent with reference to the 70.5 A.F.S. fineness number (Table 2).

Compare Test Machines

The procedure followed in checking the correlation of results of analyses between the two types of sieve shakers was to make two analyses of nine samples. For all nine samples, the first analysis was made with a type (A) sieve shaker, and the second analysis was made with a type (B) sieving machine. The data pertaining to these experiments are given in Table 3 and presented graphically in Figs. 4 and 5. These data

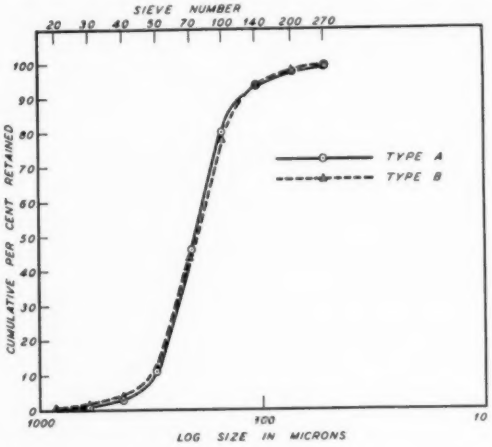

SIEVE NUMBER
20 30 40 50 70 100 140 200 270
CUMULATIVE PER CENT RETAINED
0 10 20 30 40 50 60 70 80 90 100
TYPE A
TYPE B
1000 100 10
LOG SIZE IN MICRONS

Fig. 4—Cumulative particle size distribution curves for the average values of nine samples analyzed with two types of sieve shakers (see Table 3 and Fig. 5).

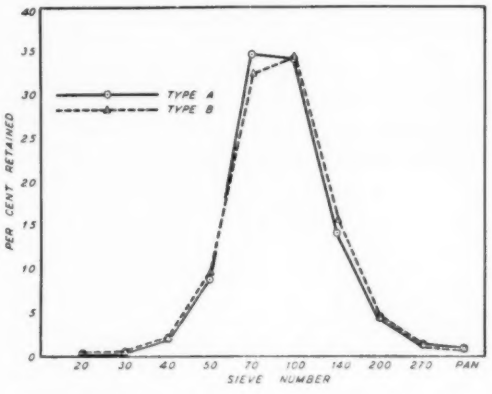


Fig. 5—Data from Fig. 4 are plotted as percentage retained instead of cumulative percentage retained.

Table 3 -- Data on Comparative Analyses of Nine Samples with Two Types (A and B) of Sieve Shakers

Sample No.	Per Cent Retained on Sieve																				A. F. S. Fineness No.	
	20		30		40		50		70		100		140		200		270		Pan			
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
23	0.0	0.0	0.4	0.4	2.3	2.4	9.6	10.3	35.8	32.8	33.0	33.7	13.2	14.7	3.9	4.0	1.2	1.1	0.8	0.6	69.0	69.2
24	0.1	0.1	0.3	0.3	1.7	1.8	7.6	8.6	33.0	31.5	34.7	34.4	15.4	16.4	4.8	4.8	1.5	1.4	1.0	0.8	72.5	72.1
25	0.1	0.1	0.3	0.3	1.8	2.0	8.4	9.4	33.8	33.3	34.2	33.6	14.3	14.6	4.6	4.6	1.4	1.4	1.0	0.8	71.4	70.8
28	0.1	0.1	0.4	0.4	2.1	2.0	8.9	9.3	34.5	32.2	33.8	34.4	14.0	15.8	4.1	4.2	1.3	1.2	0.9	0.6	70.2	70.3
29	0.1	0.1	0.4	0.4	2.1	2.1	8.7	9.9	34.2	33.3	34.1	34.4	14.1	15.8	4.2	4.2	1.2	1.2	0.9	0.7	70.2	70.1
30	0.1	0.1	0.3	0.3	1.9	2.1	8.7	9.0	34.3	31.3	34.1	34.7	14.1	16.1	4.4	4.5	1.3	1.3	0.9	0.7	70.6	71.3
31	0.1	0.0	0.3	0.3	2.0	2.1	8.9	9.3	35.3	32.0	33.8	34.5	13.4	15.6	4.2	4.2	1.2	1.2	0.8	0.7	69.6	70.6
32	0.1	0.1	0.3	0.4	2.0	2.1	9.0	9.2	34.9	31.0	33.6	34.7	13.7	16.1	4.3	4.4	1.3	1.4	0.9	0.7	70.2	71.2
33	0.0	0.1	0.4	0.4	2.1	2.1	9.0	9.8	35.4	32.2	33.4	34.2	13.4	15.1	4.1	4.2	1.3	1.2	0.8	0.6	69.6	69.9
Average Per Cent Retained																						
	0.1	0.1	0.3	0.4	2.0	2.1	8.8	9.4	34.6	32.2	33.9	34.1	13.9	15.6	4.3	4.3	0.3	1.3	0.9	0.6		
Cumulative Average Per Cent Retained																						
	0.1	0.1	0.4	0.5	2.4	2.6	11.2	12.0	45.8	44.2	79.7	78.3	93.6	93.9	97.9	98.2	99.2	99.5	100.1	100.1		

present a comparison of the relative abilities of the two sieve shakers to separate a sample into its component sieve fractions. The comparison is relative, not absolute, because the two pieces of apparatus were checked against each other, and not against a fully reliable standard.

The data in Table 3 reveals that the average values of the cumulative percentages retained on different sieves are nearly the same for both types of sieve shakers (Fig. 4). If average percentages retained are considered (Fig. 5), it is apparent that a somewhat higher percentage was retained on the No. 70 sieve in those analyses made with the type (A) sieve shaker than in the analyses made with the type (B) sifter. On the No. 140 sieve the opposite effect occurred, while on all other sieves the differences were slight.

Test Apparatus Variables

One would probably suggest that the differences between the two analyses of each sample were in part due to the effect of prolonged sieving because the first 15-min sieving on each sample was made with a type (A) sieve shaker and the second 15-min sieving was made with a type (B) sifter. However, a comparison between the results given in Tables 3 and 2 reveals that most of the difference between the analyses made with two different sieve shakers was caused by the apparatus variables and not the sieving time effect.

For example, Table 3 reveals that the average difference in percentage retained on the No. 70 sieve between the analysis made with the type (B) sifter and that with the type (A) sieve shaker was 2.4 per cent. Table 2 shows that the maximum difference between consecutive analyses on one sample with a type (A) sieve shaker was less than 1.0 per cent for the same sieve fraction.

The data in Table 3 indicate that there are some differences in results between the two sieve shakers when percentages retained are considered as is shown in Fig. 5, but these differences nearly cancel each other if data are plotted as cumulative curves (Fig. 4). The average A.F.S. fineness numbers for the nine samples were found to be 70.4 for the rotary (type A) shaker, and 70.6 for the gyratory (type B) shaker.

Conclusions

Under the conditions of the analyses made in this study the vibratory and rotary type sieve shakers will yield approximately the same results on a given sample with the same set of sieves. Of nine samples analyzed with both types of apparatus, the average A.F.S. fineness number for the analyses made with the rotary sieve shaker was 70.4, while the average for the analyses made with the vibratory sieve shaker was 70.6.

The maximum sampling error which can be expected for the sampling technique used and for the conditions of the experiments is about $\pm$ 3.4 per cent in terms of A.F.S. fineness numbers.

Acknowledgment

Grateful acknowledgment is made to Joseph M. Cameron, National Bureau of Standards, and Dr. Frank G. Carpenter, Research Associate, National Bureau of Standards, for their helpful suggestions.

References

1. F. A. Shergold, "The Effect of Sieve Loading on the Results of Sieve Analyses of Natural Sands," *Journal*, Society of Chemical Industry, vol. 65 (1946), pp. 245-249.

2. Sture Mörtsell, "On Accuracy of Sieve Analyses Made by Means of Sieving Machines," Kungl. Tekniska Höglans Handlingar, *Transactions*, Royal Institute of Technology, Stockholm, no. 17 (1948).

3. A. W. Fahrenwald and S. W. Stockdale, "Effect of Sieve Motion on Screening Efficiency," U. S. Bureau of Mines Technical Report 2933 (1929).

4. A. S. Swinford and Francis Swinford, "A Comparison of Three Sieve Shakers," *Journal of Sedimentary Petrology*, vol. 13, pp. 3-13 (1946).

5. L. E. Simon, *An Engineers Manual of Statistical Methods*, John Wiley & Sons, New York (1941).

6. G. W. Snedecor, *Statistical Methods*, fourth edition (1946) chapter 6, Iowa State College Press, Ames, Iowa.

Permeability meter tests influence of core washes on gas passage.

Studying washes for automotive engine cores.

MODERN FOUNDRY METHODS . . .

MODEL LABORATORY PROVIDES SAND, METAL RESEARCH AND CONTROL

New development and control laboratory of United States Graphite Co., Saginaw, Mich., contains complete facilities for studying foundry sands and refractories, mold and core washes, and their influence on castings, and serves as a model for progressive foundry laboratories. Every core and molding sand used today is available for test purposes in the laboratory and research work done with sand taken from systems of commercial foundries is always going on.

Melting problems can be investigated using the miniature cupola which provides molten metal to test sands and washes under operating conditions. Sand testing facilities are supplemented by a well developed laboratory for chemical analysis of all types of foundry materials and products.

Lining the walls and available in other areas of the sand laboratory (below) is a laboratory core oven for controlled baking of cores and dry sand specimens; desiccators for storing specimens out of contact with atmospheric moisture; sand mixing equipment; sieves and shaker for studying grain size; rammers for making the 2-in. and the 1⅛-in. specimens sand used for room

Sand testing laboratory has ample working space around equipment for convenience in running full series of tests.

and high temperature testing; high temperature sand testing furnace; muffle furnace for ignitions; moisture, permeability, and strength testing instruments with all attachments for determining deformation and for automatically drawing stress-strain curves of specimens under investigation; and auxiliary facilities.

In testing a core wash, its depth of penetration and influence on permeability are studied by coating a face of a standard 2-in. diameter specimen, drying, and running the standard permeability test. Thickness, type, and uniformity of coating can be determined on the specimen. Washes must be tested at different Baumé gravities to check surface appearance, penetration, running, build-up, and best method of application.

Temperature effects as high as 3000 F are determined by ramming 1⅛-in. diameter cores with a small cylindrical cavity. After baking (right) the cores are coated, dried, and charged with scraps of metal (below, upper). Inserted in the hot zone of the high temperature sand testing furnace (below, lower), the metal in the core melts and forms a small pellet. Time and temperature can be controlled to duplicate castings of various section size. After cooling, the core and casting are studied for ease of removal, amount of coating remaining, burn-in, and general surface appearance.

Core oven with rotating shelf bakes cores and dries core washes for testing at room and high temperatures to check penetration, surface appearance, shrinkage, expansion.

. . . MODERN FOUNDRY METHODS

A metallurgical microscope, also used for studying microstructures, is used to examine the sand-metal interface (see front cover of magazine) of specially prepared penetration specimens which can be readily ground and polished. Another microscope use is checking castings that have been inoculated or that have been produced in the laboratory's small cupola using special charges designed to show the influence of various additives such as graphite lumps of various types and sizes.

The 4½ in. diameter cupola provides molten metal to confirm laboratory findings under actual foundry conditions. Behavior of sands, mold and core coatings, additives to sand and to metal charge in the tiny cupola can all be studied in short time at a minimum expense.

METALLURGY OF IRON BASE ROLLS

F. E. Sutherland
Dominion Engineering Works Ltd.
Montreal, Que.
Canada

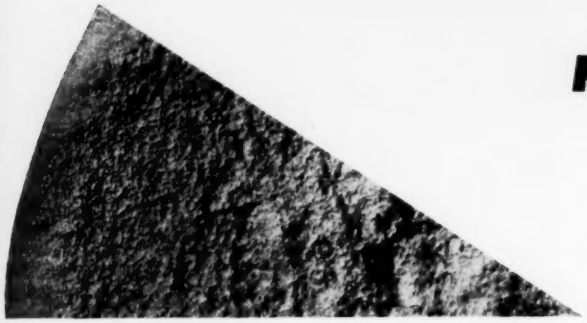


Fig. 1—Fracture of a chill iron roll shows the zone of "clear" chill, the mottled area, and the gray core.

ROLLS FOR THE METAL, plastics, flour, and paper industries may be either iron base or steel base with each type having specific uses. In general the steel-base rolls are used where strength is most important; the iron-base rolls where finish, wear, heat resistance, and hardness are the prime considerations. Iron-base rolls, each with individual characteristics and applications, are known as "chill" rolls and "grain" or "alloy" type rolls.

On the surface of the roll, up to a commercial depth of about 1½ in., there is an area of clear chill in which the total carbon content of the iron is in the combined state. This area is white in color, extremely hard, highly wear resistant, and capable of taking a high degree of polish. In the core of the roll the carbon exists mainly in form of graphite flakes. The core metal has a gray appearance, coarser grain, but is softer and more shock resistant.

Intermediate between the gray core and white chill is a mixture of the two types, known as the mottled area, which in good roll practice is approximately equal in depth to that of the clear chill. The mottling is not uniform throughout its depth. Immediately below the clear chill the white iron predominates, while at the inner limit of the mottle the gray iron predominates (Fig. 1).

These depths for clear chill and mottle are considered maximums, and may be controlled within comparatively small limits (plus or minus 0.025 in.) by altering the chemical properties. Also, by altering the chemical properties the nature of the chill may be controlled over a considerable range of hardness —58-75 scleroscope.

Hardness Depth Limited

The hardness of the chill roll is maintained to the extent of the clear chill depth. Beyond this depth the hardness falls off rapidly. This limits the use of chill rolls to flat rolling or to shapes that do not require passes deeper than one inch. Regular chill rolls are unalloyed, but special types containing such alloys as nickel, chromium, and molybdenum are manufactured.

Grain rolls differ from chill rolls in three major respects. First, the grain roll does not have a zone of clear chill on the surface. In this case there is a partial precipitation of graphite throughout the roll section (Fig. 2). This is termed an "indefinite chill" which penetrates deeply into the roll, with the result that the hardness of the interior of the roll compares favorably with that of the surface. The decrease in hardness is gradual rather than sharply defined (Fig. 3).

Second, grain rolls are always alloyed, nickel, chromium, and molybdenum being the principal alloys. The alloys contribute to the hardness of the roll and compensate for the lack of hard, clear chill. Third, the alloys produce certain grain refinements which increase the toughness and strength of the roll considerably beyond that of the chill roll.

Grain rolls are used where strength and toughness are required and finishing requirements are not too exacting. The uniformity of hardness enables grain rolls to be used for the rolling of large shapes and bars which require deep passes in the rolls. Grain rolls are preferable for most types of metal rolling due to their greater strength and versatility. However, they are more expensive.

Fundamental Chemistry of Chilled Iron

Carbon is the most significant non-alloying element in iron-base rolls. It has a profound effect on both the hardness and strength of the metal. The carbon content of iron-base rolls may vary from about 2.0 to 3.9 per cent, although both extremes are used only in one or two special types. Carbon in the solid state may exist in many forms, each with different properties. For the purposes of chilled iron these carbon forms may be classified into two main groups: (1) iron carbide (combined), and (2) graphite (free).

The hardening effect of carbon is directly proportional to the amount of carbon retained in the combined form. The rate of cooling has a direct bearing on the proportions of carbon which are combined or precipitated out as graphite. The faster the cooling the greater the proportion of carbides.

The rolls are cast in cast iron chills which are capable of absorbing great quantities of heat very rapidly from the metal in close proximity to the chills. Thus the metal close to the chills retains all the carbon in the combined state, while the inner areas cool more slowly and more or less of the carbon precipitates out as graphite. As hardness and strength in chilled iron are inverse ratios with respect to the carbon content, it is necessary to balance the carbon carefully according to the specifications for the particular job.

NOTE: This paper was presented, with other prize-winning entries in the Annual Technical Paper Contest of the A.F.S. Eastern Canada Chapter, at the Apr. 8, 1949 Chapter meeting.

Silicon: The graphitizing effect of silicon is well known and this phenomena performs one of the most important functions in iron-base rolls. By the addition or deletion of silicon, the control of chill depth is largely made possible. An increase in silicon decreases the chill, and vice versa.

As chill rolls are manufactured in varying degrees of hardness and varying chill depths, the silicon content must be increased or decreased depending upon the carbon content and the desired chill depth. An indication of chill control may be observed in that a 0.05 per cent addition of silicon will reduce the chill depth by $\frac{1}{8}$ in.

Manganese: In the proportions used in chill rolls manganese is a more powerful graphitizer than silicon (0.08 per cent will reduce the chill depth by $\frac{1}{2}$ in). Manganese combines with any sulphur present to form sulphides, and this feature is utilized for further chill control. Since manganese is so potent a graphitizer it is found to be easier to control the chill depth by varying only the silicon and sulphur, leaving the manganese constant.

Sulphur tends to increase the chill depth. By combining with the manganese to form sulphides, the graphitizing effect of manganese is decreased and the chill is deepened. The effect of sulphur may be seen in that 0.04 per cent sulphur will deepen the chill by $\frac{3}{8}$ in. The sulphur-manganese combination affords a means of balancing the chill-reducing effects of silicon.

Sulphur also combines with iron to form iron sulphide, and this contributes to the roll hardness.

Phosphorus tends to embrittle cast iron, but this effect is not too serious in chill rolls providing the phosphorus content is held below 0.5 per cent. It also combines with iron to form hard phosphides which are not objectionable in a chill roll where hardness is the prime consideration. As phosphorus increases the fluidity of the metal, gases and foreign matter are better able to rise from the metal before it freezes, producing a sounder casting.

Molybdenum: The principal effect of molybdenum is to increase the resistance of the metal to thermal shock and heat. This is probably due to the grain refinement which is evident on the addition of molybdenum. For general use, best results are obtained with an addition of 0.2 to 0.4 per cent.

Nickel: The effects of nickel vary considerably with the amount of the alloy present. Under 2.5 per cent, nickel increases both the strength and toughness of the chill and core. Over 2.5 per cent, nickel results in an increased hardness of the chill. When 4.5 per cent nickel is present, an interesting change takes place in the structure of the metal. In this quantity nickel depresses the transformation point between martensite and pearlite to below room temperature, so that part of the iron carbide is martensitic rather than pearlitic.

A martensitic chill roll has a scleroscope hardness of 80-85, which compares to a pearlitic roll hardness of 63-67. This effect of nickel is applicable to both chill and grain type rolls. Nickel also acts as a mild graphitizer, and the chromium, silicon, and manganese are adjusted to compensate.

Chromium: The addition of chromium will deepen the chill, the mechanics of which is the reverse that of silicon. It is also a carbide-forming element, which enhances the hardness but at the same time may embrittle the metal. Chromium is usually added to compensate for the graphitizing effect of nickel. It is sometimes used in high carbon chill rolls to obtain a desired chill depth when it would be difficut to reduce the silicon and manganese to the suitable proportions.

The grain roll differs from the chill roll in that it has the indefinite chill or uniform hardness throughout the roll. The grain of the metal is very fine and the small flakes of graphite are uniformly dispersed. The roll is tougher and stronger. The refinement of the grain is mainly a function of the alloy present, with nickel and molybdenum being most important in this respect. The precipitation of the graphite throughout is a function of the silicon, manganese, and sulphur content.

To produce a roll in which the carbon is in the graphitic form it is necessary to increase the graphitizing elements and decrease the graphite inhibitors. That is, increase the silicon and manganese and decrease the sulphur. The phosphorus is also reduced to a minimum (below 0.15 per cent) as the hard phosphides scattered throughout the metal would be most objectionable. The hardness of the grain roll is maintained by the proportion of carbides formed when the metal is chilled, supplemented by the hardening tendencies of the alloys present.

Metallurgy of Chilled and Grain Type Rolls

The manufacture of iron-base rolls has been more or less standardized according to specifications. As a result, typical analyses have been developed to fulfill these specifications, and the compositions shown in the Tables are considered standard for each particular grade. All analyses for chilled rolls will be for an average chill depth.

Regular plain chilled rolls are manufactured in four grades of hardness: mild, medium, hard, and extra hard. Metal compositions are shown in Table I, and it may be seen that as the carbon increases the hardness increases. Manganese is kep' constant in all cases because it is such a potent graphitizer that results are erratic when the manganese contents are changed. The silicon and sulphur vary considerably between the two extremes. This is to maintain a constant chill depth over the carbon ranges.

Molybdenum chilled rolls are manufactured in various grades also, but one analysis should be sufficient.

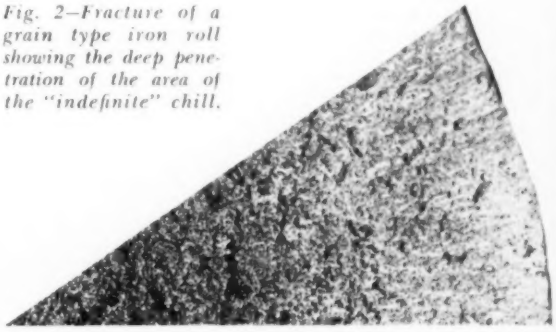


Fig. 2—Fracture of a grain type iron roll showing the deep penetration of the area of the "indefinite" chill.

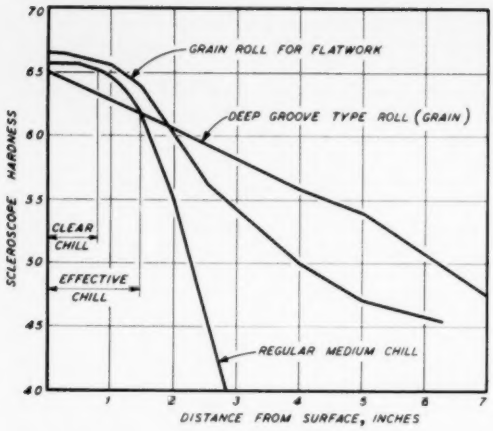


Fig. 3—Effective scleroscope hardnesses of chill and grain type iron-base rolls are compared graphically.

These rolls are used for sheet rolling and are noted for their resistance to heat and fire cracking. They have the following analysis: C, 3.10; Mn, 0.25; P, 0.45; S, 0.100; Si, 0.65; Ni, —; Cr, —; Mo, 0.30; scleroscope hardness, 60-65.

This is a medium-hard roll, and the analysis closely corresponds to that of a medium-hard plain-chilled roll. The 0.30 per cent molybdenum is considered to be the optimum point. Molybdenum may be increased to about 0.50 per cent, but there is no appreciable change when it is increased to 1.0 per cent. Over 1.0 per cent molybdenum will reveal certain changes, but its application is very limited.

Nickel chilled rolls are manufactured in two grades, medium and hard. These rolls are used in plate rolling or other work where a hard and polished surface together with strength is required. Compositions are shown in Table 2.

The medium nickel chill roll compares in hardness with the regular hard chill. However, the carbon is lower as the nickel contributes to the hardness of the chill. The silicon and manganese are slightly lower due to the graphitizing effect of the nickel. The chromium is added to balance the graphitizing effect of the nickel.

Carbon is reduced in the hard nickel chill. This is done to develop the chill depth. The silicon, manganese and sulphur are the same as with the medium-nickel chill. The large amount of chromium again offsets the graphitizing effect of the nickel. The extreme hardness of the roll is derived from the martensitic structure which results when the nickel content exceeds 4.0 per cent.

Grain type rolls are also manufactured in various grades of hardness. The compositions given in Table 3 show their differences.

A comparison of the analyses in Table 3 with those of the regular chilled roll show that manganese and silicon are increased and phosphorus is reduced. These are the essential differences between the grain and chilled roll. The suphur also is lower, but this is because it has not been added to develop a chill depth. The alloys in the grain roll maintain the hardness even though there is a reduction of the iron carbide formed.

The effect of nickel in the grain rolls is mainly on the structure of the metal, while the effect of the chromium is its tendency to form carbides. Molybdenum is always present in grain rolls although its exact effects are somewhat difficult to define. It is generally felt that it increases toughness and resistance to fire cracking.

One other type of roll which is rapidly gaining in popularity is known as the "special process roll." This roll has an outer shell which may be either a high alloy nickel chill or nickel grain depending upon the nature of the work it will be called upon to perform. The core, however, is produced from a high strength gray iron. A special technique has been developed for the casting of these rolls.

The compositions shown in Table 4 may be considered as standard for the nickel-chill and nickel-grain shells. The core metal, known as fill metal, has a single analysis.

The nickel-chill and nickel-grain shells have identical hardnesses, obtained by the large addition of chromium in the case of the nickel grain. Otherwise, their compositions are similar to regular chill and grain rolls. The fill metal is unalloyed but, as a result of the casting methods, it becomes mixed with the shell metal and produces a strong alloyed iron.

Running a Heat

To calculate the charge analysis, the roll metallurgist must consider the following points: (1) type of roll (grain or chill): (2) chill depth if a chill roll: (3) hardness; (4) weight. The roll diameter also has important implications. As the many grades of rolls have been more or less standardized, the metallurgist will have a type analysis to follow, with considerations only for chill depth and roll diameter.

The charge is made up of worn rolls, foundry roll scrap (gates, risers, etc.), pig irons, and alloys as required. The worn rolls form the most important source of metal. The worn rolls must be of the same type of roll as the one that is to be manufactured.

TABLE I—METAL COMPOSITIONS FOR PLAIN CHILLED ROLLS

	Components, per cent								Scleroscope
	C	Mn	P	S	Si	Ni	Cr	Mo	Hardness
Mild Chill	2.90	0.25	0.45	0.085	0.70	—	—	—	55-62
Medium Chill	3.20	0.25	0.45	0.100	0.65	—	—	—	63-67
Hard Chill	3.50	0.25	0.45	0.130	0.60	—	—	—	68-72
Extra Hard Chill	3.70	0.25	0.45	0.150	0.50	—	—	—	73-77

TABLE 2—NICKEL CHILL ROLLS—METAL COMPOSITION

	Components, per cent								Scleroscope Hardness
	C	Mn	P	S	Si	Ni	Cr	Mo	
Medium Nickel Chill.....	3.35	0.22	0.45	0.130	0.55	1.75	0.35	0.30	68-72
Hard Nickel Chill.....	3.15	0.18	0.45	0.130	0.45	4.5	0.75	0.30	80-85

TABLE 3—GRAIN TYPE ROLLS—METAL COMPOSITION

	Components, per cent								Scleroscope Hardness
	C	Mn	P	S	Si	Ni	Cr	Mo	
Nickel Grain Roll.....	3.00	0.45	0.15 max.	0.065	1.15	1.00	0.75	0.30	58-62
Medium Grain Roll.....	3.20	0.45	0.15 max.	0.080	0.90	1.80	0.85	0.30	63-67
Hard Grain Roll.....	3.20	0.45	0.15 max.	0.080	0.90	3.00	1.50	0.30	68-72

That is, worn calendar rolls would be used to manufacture new calender rolls.

Pig irons form an important part of the charge. They are used to replace the carbon, manganese, and silicon that have been burnt out of the old metal. They also serve to dilute the sulphur that may have been added in excess in the old metal. Pig iron also restores the "life" to remelts and restores the balance between hardness and toughness.

Pig irons possess inherent qualities typical of the particular grade, and the metallurgist will utilize two or even three grades of pig iron in the charge in order to take advantage of these qualities. One other obvious use of pig iron is to adjust the analysis of the charge to fulfill the specifications.

Typical grades of pig iron are charcoal pig, malleable pig, high-phosphorus pig, and low-phosphorus pig. Compositions are shown in Table 5.

Charcoal pig is considered to be the best for chilled rolls but, as it is in short supply, malleable pig is now used to the limits allowed by the silicon content. High-phosphorus pig is used to bring up the phosphorus and dilute the manganese. The low-phosphorus pig is ideal for grain rolls but, as this type is also in short supply, the malleable pig is used to the limits allowed by the phosphorus.

After the charge calculations concerning the worn rolls and pig irons have been made, it may be necessary to make adjustments with ferrosilicon, ferromanganese, and iron sulphide. Alloys, if required, are usually placed with the charge, and they are added in the following forms: nickel—pure electrolytic nickel; chromium—high-carbon ferrochromium; and molybdenum—molybdenum oxide.

All rolls, with the exception of some calender rolls, are melted in the air furnace. This is the most convenient furnace because it has a removable roof which facilitates charging and allows the use of large pieces of scrap. Its capacity (25 tons) is also an important feature. The air furnace enables close control to be maintained over the duration of the heat, and tests may be made during the melting process and analysis or chill adjustments made in the furnace.

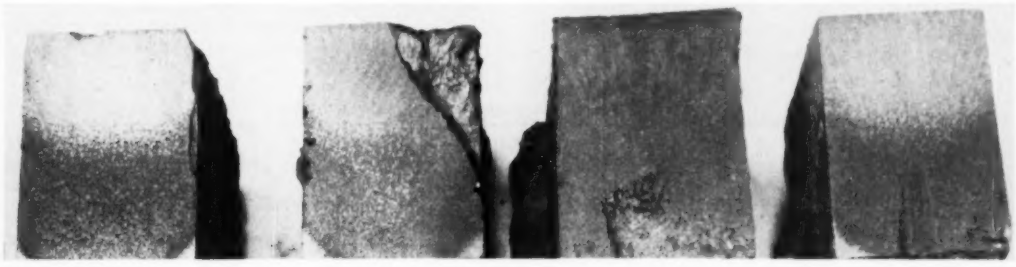
The furnace is fired with bituminous coal which is highly volatile and burns rapidly. Combustion takes place in contact with the metal but not as intimately as in a cupola. Oxidation losses are considerable. A melt requires about 5½ hr to complete, at which time the metal is poled to ensure a perfect mixture.

Carbon, silicon, and manganese are oxidized in the air furnace and losses are allowed for as follows: carbon—0.20-0.25 per cent; manganese—0.06-0.1 per cent; and silicon—0.10-0.15 per cent. At the same time the metal in the air furnace will tend to pick up sulphur.

High-carbon calender rolls are charged into a cupola as carbon losses are reduced when the metal and coke are intimately mixed. Manganese and silicon are again lost, and considerable sulphur is picked up from the coke.

It can be seen that for chill rolls the charge analysis must have higher carbon, manganese, and silicon than

Fig. 4—Test specimens from a chill roll heat of composition: C, 3.48; Mn, 0.28; P, 0.45; S, 0.22; Si, 0.70 per cent. From left to right are: first test showing 7/16 in. clear chill depth; second test 45 min later showing 7/16 plus in. clear chill depth; an addition of 0.10 per cent graphite decreases clear chill depth to 3/8 in.; sulphur in the form of iron pyrites (0.10 per cent addition) increases the clear chill depth to 9/16 in.



is desired due to the oxidation in the furnace. The charge analysis is also calculated to produce a slightly shallower chill than desired as it is easier to increase the chill than decrease it in the final stages.

For grain type rolls the silicon and manganese are calculated slightly low and additions are made in the form of ferromanganese and ferrosilicon after preliminary tests have been made.

When the metal is melted and poled it is ready for the preliminary test. A small ladle of the metal is dipped from the furnace and poured into three small molds. The first sample is cast into a small metal mold to be crushed for the chemical analysis. The other small molds are about 8½ x 1¾ x 6 in., and 2 x 2 x 6 in. The first of these molds is sand on three

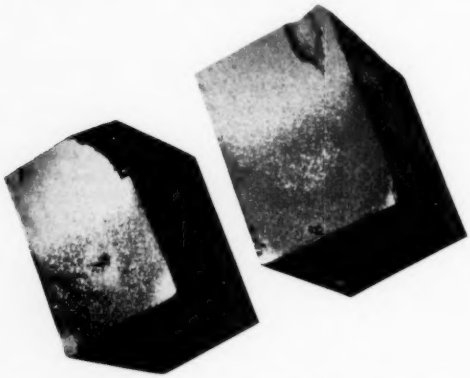


Fig. 5—Test specimens from a chill roll heat of composition C, 3.42; Mn, 0.28; S, 0.10; P, 0.45; Si, 0.70 per cent. Depth of mottled zone in proportion to clear chill is reduced by a 0.10 per cent graphite addition.

sides, a cast iron chill forming the fourth side; the second is an all sand mold.

The metal is allowed to cool in the molds and the blocks are fractured. The all sand mold indicates the nature of the metal that will form the shoulders and journals of the roll, and the fracture from the mold with the chill will show the chilling tendency of metal and, after certain empirical interpretations, the final chill depth on the roll. Elements such as carbon affect the relation between block readings and roll readings and considerable experience is required to interpret the chill tests correctly.

If the chill depth proves to be close to requirement, no corrections in the anaylsis should be made. Should the chill be too shallow, iron ore may be added to the heat. This oxidizes the silicon and manganese, thus increasing the chill depth. Considerable discretion must be used as an ored heat produces a very deep mottled zone in the chill.

Should the chill be too deep about 0.05 per cent silicon is added to hold the heat and prevent the chill from deepening. When the chemical analysis is known, it is determined whether the silicon or manganese is too low and suitable adjustments are made.

Should the carbon be low, nothing can be done but to increase the silicon to stabilize the chill depth. This will produce a roll on the soft side. Little can be done if the carbon is too high, and no attempt should be made to adjust it if it is close.

After the necessary adjustments have been made as a result of the preliminary test, the metal is again poled and a second chill test made. By this time the metal should be close to the required specifications and the only corrections necessary should be in the form of small ladle additions. Large ladle additions are undesirable as they tend to cool the metal and the mixture may not be homogeneous.

At this point the over-all analysis of the metal ceases to be important. The chill depth becomes the prime consideration. Should the second test show the chill to be too shallow, sulphur is added in the form of iron pyrites (Fig. 4). If it is a high-carbon roll, chromium may also be added to deepen the chill. If the chill is too deep, silicon or manganese is added, depending upon the analysis.

Granular Graphite Additions

Occasionally it is desirable to reduce the depth of the mottled zone in proportion to the clear chill zone (Fig. 5). To do this, granular graphite is added to the ladle. The graphite tends to encourage the precipitation of the carbon in the metal as fine flakes. The process is similar to dropping a crystal into a supersaturated solution, with the resultant precipitation. The effect is a stronger and tougher roll.

Running a grain-roll heat does not present the same problems as with a chill roll. In this case the analysis is the most important consideration. The charge analysis is made up as previously described, and when the charge is melted the first test is dipped out. This is primarily for the chemical analysis, but the sand and chill tests are also made. The sand test again indicates the nature of the metal which will form the necks and journals. The chill test is not conclusive as the results are most difficult to interpret.

When the chemical analysis is known, the necessary corrections are determined and additions may be made either to the ladle or to the bath immediately before tapping. Usually it is not necessary to correct for the alloys as melting in the air furnace does not appreciably affect them.

Pouring temperatures are an important consideration and they are carefully controlled. Chill rolls are

TABLE 4—NICKEL CHILL AND NICKEL GRAIN SHELLS

	Components, per cent								Scleroscope Hardness
	C	Mn	P	S	Si	Ni	Cr	Mo	
Nickel Chill Shell....	3.15	0.18	0.45	0.130	0.45	4.5	0.75	0.30	80-85
Nickel Grain Shell...	3.15	1.20	0.15 max.	0.080	0.90	4.5	1.80	0.30	80-85
Fill Metal	3.25	0.60	0.25	0.080	1.00	—	—	—	—

TABLE 5—TYPICAL PIG IRON COMPOSITIONS

Pig Iron Grade	Components, per cent				
	C	Mn	P	S	Si
Charcoal	4.2	0.30-0.45	0.40-0.70	0.025 max.	0.50-0.75
Malleable	4.2	0.60-0.90	0.25 max.	0.035 max.	1.25-1.50
High Phosphorus	4.0	0.30 max.	1.75 max.	0.045 max.	0.90-1.15
Low Phosphorus.	4.2	0.20-0.80	0.035 max.	0.035 max.	0.75-1.75

cast at 2420 F, while grain rolls are cast 60 degrees higher. Chill rolls are cast cold because of the tendency for pinholes to form if the temperature is too high. Grain rolls are cast hotter as this tends to refine the grain structure. Also, the low phosphorus content decreases the fluidity of the metal. Grain rolls cast at too low a temperature may show hot tears. Care must be taken not to cast either type of roll too hot as the metal may fuse to the chills. Large rolls are cast at a lower temperature than small rolls.

Future Meetings and Exhibits

NATIONAL ASSOCIATION OF FOREMEN, annual meeting, Hotel Statler, Buffalo, N. Y.—Sept. 13-18.

INSTRUMENT SOCIETY OF AMERICA, fifth national instrument exhibit, Memorial Auditorium, Buffalo, N. Y.—Sept. 18-22.

STEEL FOUNDERS' SOCIETY, annual fall meeting, The Homestead, Hot Springs, Va.—Sept. 25-26.

ASSOCIATION OF IRON AND STEEL ENGINEERS, annual convention and exposition, Cleveland Public Auditorium, Cleveland—Sept. 26-29.

ALL-CANADIAN FOUNDRY CONFERENCE, sponsored by A.F.S. Eastern Canada and Ontario Chapters, Hamilton, Ontario—Sept. 28-30.

TEXAS REGIONAL FOUNDRY CONFERENCE, sponsored by A.F.S. Texas Chapter, Plaza Hotel, San Antonio, Texas—Oct. 5-6.

GRAY IRON FOUNDERS' SOCIETY, annual meeting, Netherland Plaza Hotel, Cincinnati—Oct. 12-13.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, annual meeting, The Greenbrier, White Sulphur Springs, West Virginia—Oct. 12-14.

NORTHWEST REGIONAL FOUNDRY CONFERENCE, sponsored by A.F.S. Washington, British Columbia, Oregon, and Oregon State College Student Chapters, Gowman Hotel, Seattle—Oct. 13-14.

NON-FERROUS FOUNDERS' SOCIETY, annual meeting, Hotel Statler, Boston—Oct. 13-15.

AMERICAN SOCIETY FOR METALS, national metal exposition and Congress, International Amphitheater, Chicago—Oct. 23-27.

NEW ENGLAND REGIONAL FOUNDRY CONFERENCE, New England Foundrymen's Society, Massachusetts Institute of Technology, Cambridge, Mass.—Oct. 27-28.

METALS CASTING CONFERENCE, A.F.S. Central Indiana and Michiana Chapters and Purdue University, at Purdue, West Lafayette, Ind.—Nov. 2-3.

STEEL FOUNDERS' SOCIETY, annual technical and operating conference, Carter Hotel, Cleveland—Nov. 9-11.

MICHIGAN REGIONAL FOUNDRY CONFERENCE, A.F.S. Detroit, Central Michigan, Saginaw Valley, and Western Michigan Chapters, Michigan State College Student Chapter, and Michigan State College, at East Lansing, Mich.—Nov. 10-11.

BIRMINGHAM REGIONAL FOUNDRY CONFERENCE, sponsored by A.F.S. Birmingham District Chapter, Tutwiler Hotel, Birmingham, Ala.—Feb. 22-23, 1951.

55th Annual Foundry Congress, American Foundrymen's Society, Buffalo, N. Y.—Apr. 23-26, 1951.

When the roll has cooled and been removed from the chills the ends of the body are faced to expose the metal structure for measuring the chill depth. The cope end of the roll is examined thoroughly as it is here that most defects are to be found. Test bands are turned on the outside diameter of the body to make hardness tests and to determine if the body is free from gas holes, dirt, or other defects. Test bands are usually turned at the chill joints and the metal examined for gas holes.

If the roll meets all the specifications it may be finished on the lathes and grinders or shipped as a rough casting.

Acknowledgment

The author wishes to express appreciation to G. E. Tait and F. Clark for their assistance in preparing the paper; to H. Lawson who supplied the photographs; and to the management of Dominion Engineering Works for permission to present the paper.

Chromium Steel Castings Solve Oil Industry Corrosion Problems

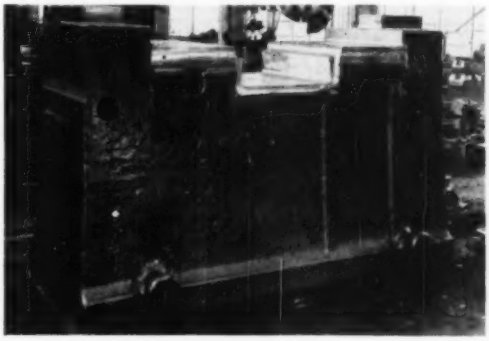
NEWLY-PERFECTED after seven years of intensive research, a 12 per cent chromium alloy developed by Lebanon Steel Foundry, Lebanon, Pa., is now being used in steel castings to solve a multi-million dollar corrosion problem for the oil and gas industry.

Used in production of valve bodies, fittings and similar parts, these castings withstand pressures in gas condensate wells often as high as 10,000 to 15,000 psi, with yield points ranging from 50,000 to 160,000 psi, depending on heat treatment.

Produces 290,000-Lb Steel Casting

ONE OF THE HEAVIEST steel castings ever produced—a cast steel anvil base for a 20,000-lb forging hammer—has been completed at the Chicago Works of the Continental Foundry & Machine Co., East Chicago, Ind. Weighing more than 145 tons, the steel block was cast in one piece in a single mold.

Difficult and delicate pouring operations were involved and three open hearth furnaces were required



to melt steel for the casting, which measures 6 ft, 3 in. x 14 ft x 9 ft, 5 in. high.

Approximately 9½ minutes were required to complete pouring and the molten mass was allowed to cool for seven weeks before removal from sand.

Letters to the Editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Discusses Core Oil Evaluation And Offers Data On Core Gas

I read with interest the article on *"Core Oil Evaluation Method"* by R. H. Olmsted which appeared in the June 1950 issue of AMERICAN FOUNDRYMAN. I was particularly interested because the evaluation of core binders has been one of my favorite topics of discussion and study for a number of years. I hope that we will see many more articles on this subject. Too many foundrymen do not realize how they are wasting time and money by using core binders which are either inferior or unsuited to their purpose To make tests which would be applicable to a number of foundries would require considerable time and equipment if any sort of agreement in results could be expected. However, where the aim is only to make comparative tests in the same foundry, very simple, cheap, yet practical equipment can be used. In previous articles I have suggested several ideas along this line.

Mr. Olmsted has mentioned several factors that are very important and which I feel should be accentuated. He mentioned the use of a laboratory oven. This is a necessity, but several suggestions are in order. First, it should be equipped with a fan or other effective means of distributing heat uniformly and dissipating the moisture which is evolved in the core drying operation. Secondly, good temperature control (± 5 or ± 10 F) is necessary. May I also suggest that record be kept of humidity readings (actual, not relative) during each test. This may explain many variations obtained from day to day, since atmospheric humidity has a great effect on the core drying operation.

Mr. Olmsted also mentioned a standard sand and a reference binder. Both of these are important. A sand supply of uniform grain size should be set aside for such testing. For a reference binder it is advisable to use pure linseed, pure tung oil, or some such undiluted oil to avoid any difficulties which might arise from improper blending. At least one set of standard reference specimens should accompany every core test load being baked.

Although Mr. Olmsted chose a good average when he selected 400 F as the best baking temperature, it should be pointed out that this will not show the entire story. In tests which I made, four out of six linseed base oils obtained peak strength at 400 F, one at 450 F and one at 500 F. Out of three petroleum base oils, two obtained peak strength at 400 F and one at 450 F. These results are shown in Fig. 4 and 5 (upper curves), respectively. With urea resin binders, two of five showed peak strength at 300 F, two at 325 F and one at 350 F. Of three cereal flour binders, two showed peak strength at 300 F and one at 325 F as shown in Fig. 6 and 5 (lower curves), respectively. Therefore, in order to be fair about strength properties, it is necessary to first determine the optimum time and temperature for maximum strength of each binder. Then the comparative optimum strengths may be compared.

Even this, however, is not the entire story for the shape of the baking curve at the temperature of maximum strength is also important. If the curve levels out at that temperature then the time element is not

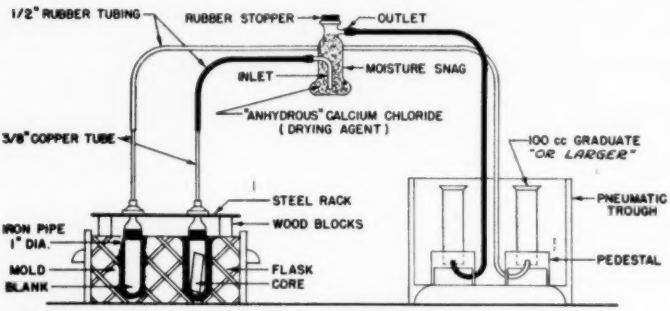


Fig. 1—Core gas test equipment built from readily available materials.

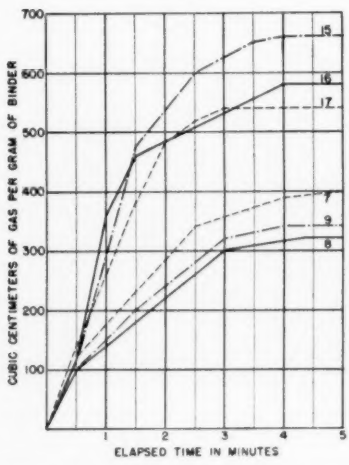


Fig. 2—Curves show rate of evolution and volume of gas from cereal flour binders (upper) and petroleum base core oils (lower).

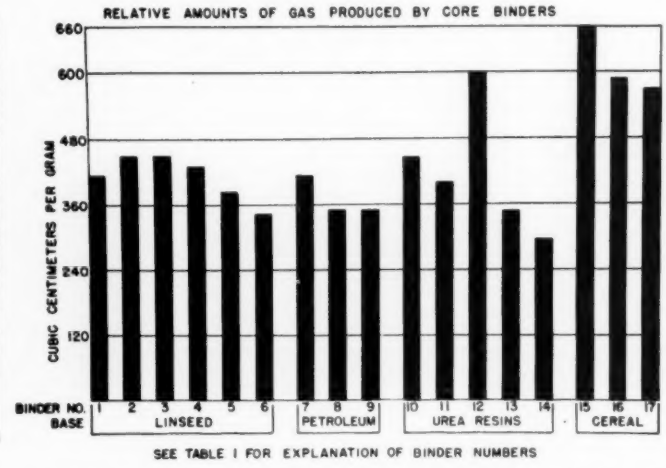


Fig. 3—Bar graph showing relative amounts of gas produced by core binders tested.

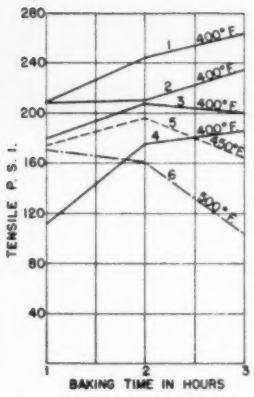


Fig. 4 – Peak strength curves, linseed binders. Numbers refer to Table 1.

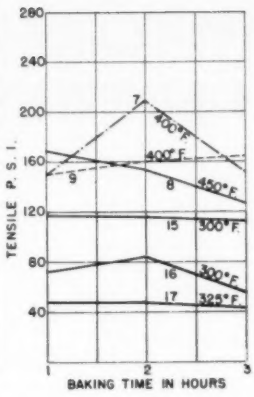


Fig. 5 – Petroleum base binders (upper), cereal flour binders (lower).

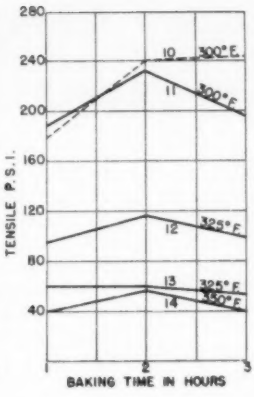


Fig. 6–Peak strength baking curves for five urea resin foundry core binders.

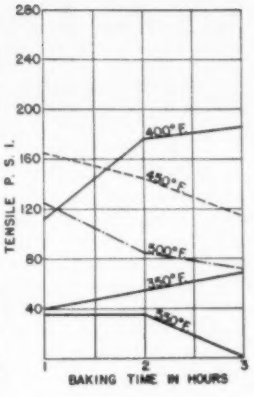


Fig. 7 – Baking curves of pure linseed (binder 4) show effect of temperature.

TABLE 1 – COMPARISON OF PROPERTIES OF CORE BINDERS IN DECREASING ORDER OF OVERALL DESIRABILITY

Binder No.	Base	Strength	Relative Economy	Total Gas	Rate of Gas Evolution	Collapsibility	Internal Hardness	External Hardness	Baking
11	Urea Resin	3	10	4	6	3	3	1	2
1	Linseed	1	1	5	11	6	1	2	7
10	Urea Resin	2	12	7	4	4	3	1	2
2	Linseed	3	4	8	9	5	2	3	7
7	Petroleum	4	3	5	9	6	8	9	6
9	Petroleum	8	8	2	10	4	6	5	7
15	Cereal Flour	9	2	12	3	4	9	10	1
3	Linseed	4	7	8	9	4	5	8	6
5	Linseed	6	5	3	9	5	7	8	9
4	Pure Linseed	5	11	6	13	4	4	4	7
6	Linseed	7	6	2	12	3	10	6	10
14	Urea Resin	12	15	1	8	1	16	1	5
16	Cereal Flour	10	9	10	2	4	12	11	2
8	Petroleum	7	9	2	12	5	11	7	8
12	Urea Resin	9	14	11	1	2	14	8	4
13	Urea Resin	11	15	2	7	1	15	13	3
17	Cereal Flour	13	13	9	5	2	13	12	3

too critical for production baking. This condition is shown by Fig. 7 at 400 F bake.

If the curve rises sharply to a peak and then drops sharply, this is an indication that the binder will overbake quickly at that temperature and may cause trouble in production baking. This is shown by curve No. 7 in Fig. 5. If the curve is still rising then baking is incomplete and the binder may be a slow baking type. This would be illustrated by curve No. 2 in Figure 4.

In addition to the strength and baking characteristics, there are other important properties such as collapsibility, amount of gas given off by cores, and rate of gas evolution. Fig. 1 shows a crude setup for measuring gas evolved from cores and Fig. 2 shows how different binders can give off widely varying amounts of gas.

Not only the total amount of gas given off, but the rate at which it is evolved is important. If gas is evolved heavily while metal is still molten or after it is firmly set, then little difficulty will occur. However, if large amounts of gas come off while the metal is semi-solid, severe blows can result. How different binders can behave is illustrated by Fig. 2 (upper and lower sets of curves). Both the amount of gas and rate of gas evolution differ widely as between the two types illustrated.

After all the data have been gathered it can be recorded in a table similar to that shown in Table 1. The good and bad points of each binder can be evaluated and choice of binder made. In Table 1, increasing numbers denote decreasing desirability of binder for the particular property. For each of the headings, No. 1 means, respectively: greatest strength, greatest strength per unit cost, lowest gas content, fastest evolution of gas, most rapid collapsibility, highest internal hardness, highest external hardness, and lowest temperature and time of baking. Lowest total of all values across the table indicates the best all around binder, but careful evaluation should be made for particular properties.

HIRAM BROWN, *Chief Met.*
Solar Aircraft Co.
Des Moines, Iowa

Aye, Aye, Sir!

I wish to congratulate the officers and staff of the American Foundrymen's Society for producing such a wonderful show as was put on this year in Cleveland. Such well-organized sessions could not have materialized without a great amount of effort and know-how and this surely must have been the best exhibition held during the history of the Society. Looking back, I know I have gained much by my attendance, not only in additional knowledge of the various aspects of the industry, in seeing new equipment and methods, but also in the friendships and personal contacts I made with the spark plugs who contribute much to the advancement of the foundry industry. Too much cannot be said for the members of the Northeastern Ohio Chapter for their untiring efforts to insure the success of the Convention and their hospitality shown visitors to their city.

One of the highest compliments one can receive in the Navy is to be told that a

(Continued on Page 91)

A.F.S. Foundry Glossary . . .

DEFINES USEFUL FOUNDRY TERMS

IN PRE-PUBLICATION FORM, the second part of an extensive foundry terms glossary to be published by the American Foundrymen's Society is presented in this issue of AMERICAN FOUNDRYMAN. Succeeding issues will contain the remainder of the glossary. Object of preliminary publication of this work is to secure comments and criticisms of readers to the end that the final booklet will be as complete and useful to the foundry industry as possible. Cooperation is solicited and suggestions for changes, additions, and deletions should be sent to Jos. E. Foster, Technical Assistant, American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

Final version of the glossary will combine comments of AMERICAN FOUNDRYMAN readers with those of a newly organized Committee on Foundry Terminology made up of members of each A.F.S. Division. Result will be a comprehensive explanation of terms used in the foundry industry.

PART II

(Continued from July, 1950, issue)

B

brinell hardness—The value of hardness of a metal, tested by measuring the diameter of the impression made by a ball of given diameter applied under a known load. Values are expressed in Brinell hardness numbers.

briquets — Compact cylindrical or other shaped blocks formed of finely divided materials by incorporation of a binder, by pressure, or both. Materials may be ferroalloys, metal borings or chips, silicon carbide, etc.

British thermal unit (Btu)—The quantity of heat required to raise the temperature of 1 lb of water 1 F at or near its point of maximum density; a unit of heat measurement.

bronze—Copper-base metals with tin as the major alloying element.

buckle—An indentation in a casting resulting from an expansion scab.

built-up plate — A pattern plate with the cope pattern mounted on or attached to one side and the drag pattern on the other. See MATCHPLATE.

bull ladle—A large ladle for carrying molten metal, having a shank and two handles.

bullion—An alloy containing sufficient precious metal to make parting or recovery profitable.

burned sand—Sand, the tenacity of whose clayey portion has been destroyed by the heat of the metal.

burning in—Rough surface of casting due to metal penetrating into the sand.

burning on—Repairing a defective part of a casting by pouring fluid metal on it until the defective part has become fluid, the whole mass thus fusing together.

burnt — Term applied to a metal permanently damaged by having been heated to a temperature close to the melting point.

burnt-on sand — A misnomer usually indicating metal penetration into sand resulting in a mixture of sand and metal adhering to the surface of the casting.

burnt sand—Sand in which the binder has been burned by contact with molten metal.

butt rammer—The flat end of the molder's rammer.

butt welding—Joining two edges or ends by placing one against the other and welding them.

C

calcium-aluminum-silicon—An alloy composed of 10 to 14 per cent calcium, 8 to 12 per cent aluminum and 50 to 53 per cent silicon used for degasifying and deoxidizing steel.

calcium boride — An alloy of calcium and boron corresponding when pure to formula CaB_6 containing about 61 per cent boron and 39 per cent calcium, and used in deoxidation and degasification of non-ferrous metals and alloys.

calcium carbide — A gravish-black, hard, crystalline substance made in the electric furnace by fusing lime and coke. Addition of water to calcium carbide forms acetylene and a residue of slaked lime.

calcium-manganese-silicon—An alloy containing 17 to 19 per cent calcium, 8 to 10 per cent manganese, 55 to 60 per cent silicon, and 10 to 14 per cent iron used as a scavenger for oxides, gases and nonmetallic impurities in steel.

calcium molybdate — A crushed product containing 40 to 50 per cent molybdenum, 23 to 25 per cent lime, 3 per cent iron max., and 5 to 10 per cent silica used to add molybdenum to iron and steel produced in the open hearth, air furnace or electric furnace.

calcium silicon—An alloy of calcium, silicon and iron containing 28 to 35 per cent calcium, 60 to 65 per cent silicon, and 6 per cent iron max., used as a deoxidizer and degasifier for steel and cast iron; sometimes called calcium silicide.

captive foundry—A foundry that is a part of a manufacturing establishment where foundry operations are only incidental to the regular operation of the plant.

carbide—A compound of carbon with one or more metallic elements.

carbon equivalent — A relationship of the total carbon, silicon and phosphorus content in a gray iron expressed by the formula $C.E. = T.C.\% + \frac{Si\% + P\%}{3}$

carbonitriding — A process in which a ferrous alloy is case hardened by first being heated in a gaseous atmosphere of such composition that the alloy absorbs carbon and nitrogen simultaneously, and then being cooled at a rate that will produce desired properties.

carbonization — Coking or driving off the volatile matter from fuels such as coal and wood. (Do not confuse this term with *carburization.*)

carbon steel—Steel that owes its properties chiefly to the presence of carbon, without substantial amounts of other alloying elements; also termed "ordinary steel," "straight carbon steel," "plain carbon steel."

card of patterns—A number of patterns fastened together.

case hardening — A method of hardening the surface of a metal.

cassette, x-ray—A frame used to hold sensitized film during radiographic examination.

casting (noun) — Metal object cast to the required shape as distinct from one shaped by a mechanical process.

casting (verb) — Act of pouring molten metal into a mold.

casting, die (verb)—Pouring molten metal under pressure into a metal mold.

casting, machine (verb)—Process of casting by machine.

casting, open sand (noun)—Casting poured into an uncovered mold.

cast-gate—The ingate at which the metal is poured in.

casting box — The flask containing the mold.

casting ladle — A crucible or iron vessel lined with refractory material for conveying molten metal from the furnace and pouring it into the mold.

casting strains—Strains resulting from the cooling of a casting and accompanied by residual stresses.

cast iron—Essentially an alloy of iron, carbon, and silicon in which the carbon is present in excess of the amount which can be retained in solid solution in austenite at the eutectic temperature. When cast iron contains a specially added element or elements in amounts sufficient to produce a measurable modification of the physical properties of the section under consideration, it is called alloy cast iron. Silicon, manganese, sulphur, and phosphorus, as normally obtained from raw materials, are not considered as alloy additions.

(Continued on Page 80)

A.F.S. DIRECTORY OF CHAPTERS

1950-51 OFFICERS AND DIRECTORS

BIRMINGHAM DISTRICT CHAPTER

Chairman—Morris L. Hawkins, Supt. of Fdies, Stockham Valves & Fittings, Inc. (Mail: 5324 Seventh Court, Birmingham, Ala.)

Vice-Chairman—C. K. Donoho, Chief Met., American Cast Iron Pipe Co., P.O. Box 2603, Birmingham, Ala.

Secretary-Treasurer—Fred K. Brown, Sales Mgr., Adams, Rowe & Norman, Inc., 722 Brown-Marx Bldg., Birmingham, Ala.

Directors—Terms Expire 1951

J. A. Bowers, Melting Supt., American Cast Iron Pipe Co., 2930 N. 16th St., Birmingham, Ala.

C. P. Caldwell, Caldwell Fdy. & Machine Co., Inc., P.O. Box 650, Birmingham, Ala.

Clyde E. Hagler, Vice-Pres., Continental Gin Co. (Mail: 4212 Clairmont Ave., Birmingham 5)

B. W. Worthington, Dev. Engr., McWane Cast Iron Pipe Co., Birmingham, Ala.

Directors—Terms expire 1952

W. Guy Bagley, Asst. Sales Mgr., Woodward Iron Co., Birmingham, Ala.

R. R. Deas, Jr., Engr., Hamilton Research Co. (Mail: 304 Redfern, Birmingham, Ala.)

Directors—Terms expire 1953

Donald C. Abbott, Serv. Engr., Hill & Griffith Co., P.O. Box 1232, Birmingham, Ala.

Ray L. Farabee, Vice-Pres., Central Foundry Co., Holt, Ala.

R. L. Jackson, Exec. Vice-Pres., Production Foundries Div., Jackson Industries, Inc., 925 N. 36th St., P.O. Box 591, Birmingham.

M. W. White, Asst. Secy., Alabama Clay Products Co., 835 Martin Bldg., Birmingham 3, Ala.

BRITISH COLUMBIA CHAPTER

Chairman—Lovick P. Young, Met., A-1 Steel & Iron Foundry, Ltd. 29 W. 3rd Ave., Vancouver, B.C., Canada.

Vice-Chairman—W. M. Armstrong, Assoc. Prof., Dept. of Mining & Met., University of British Columbia, Vancouver, B.C., Canada.

Secretary-Treasurer—W. R. Holeton, B.C. Research Council, (Mail: 2612 W. 14th Ave., Vancouver, B.C., Canada.)

Directors—Terms expire 1951

Fred Bay (Retired) 1342 Broadway, Vancouver, B.C.

J. A. Dickson, Owner, Dickson Foundry Co., (Mail: 3036 Kitchener St., Vancouver, B.C., Canada.)

Directors—Terms expire 1952

John Minot, Vivian Diesels & Munitions, Ltd., 1660 Station St., Vancouver, B.C., Canada.

Alex Paterson, Iron Fdy. Fmn., Terminal City Iron Works, Ltd., 1949 Franklin St., Vancouver, B.C., Canada.

Directors—Terms expire 1953

Herbert Heaton, Fdy. Supt., Heap's Engr. (1946) Ltd., New Westminster, B.C., Canada.

Norman Shewing, Sales, Industrial Supplies Ltd., 744 W. Hastings St., Vancouver, B.C., Canada.

Samuel C. Stewart, Fdy. Fmn., Canada Sumner Iron Works Ltd., (Mail: 2854 Georgia St., East Vancouver, B.C.)

CANTON DISTRICT CHAPTER

Chairman—T. W. Harvey, Chief Engr., Pittsburgh Valve & Fittings Div., The Pitcairn Co., Barberton, Ohio.

Vice-Chairman—Chester B. Williams, Gen. Supt., Massillon Steel Castings Co., (Mail: 1650—10th St., N. E., Massillon, Ohio)

Secretary—Dale Crumley, Ptn. Shop Fmn., Pitcairn Co., Barberton, (Mail: 377 Broad St., Wadsworth, Ohio)

Treasurer—Fred A. Basler, Sales Engr., A.P. Green Fire Brick Co. (Mail: 1425 Fulton Road, N.W. Canton 4, Ohio)

Directors—Terms Expire 1951

Robert Cairnie, Owner, The Orville Bronze & Aluminum Co., Central Court, Orville, Ohio.

V. H. Horning, Mgr. Fdy. Div., Columbiana Pump Co., Columbiana, Ohio.

Charles Reyman, Jr., Fdy. Fmn., Atlantic Foundry Co., 182 Beaver St., Akron, Ohio.

Directors—Terms Expire 1952

T. W. Daniels, Carnegie Illinois Steel Co. (Mail: 1703 Oberlin Court, N. W., Canton, Ohio)

Roy E. Jordan, Fdy. Supt., F. E. Myers & Bros. Co., (421 Buckeye St., Ashland, Ohio).

Robert A. Epps, Consultant, Stoller Chemical Co., 31 N. Summit St., Akron, Ohio.

Directors—Terms Expire 1953

R. L. Fasig, Asst. Wks. Mgr., Ashland Malleable Iron Co., Ashland, Ohio.

John R. Kerr, Jr., Fdy. Fmn., The Deming Co., (Mail: 439 N. Lincoln Ave., Salem, Ohio)

Ernest Lancashire, Development Works, Union Metal Mfg. Co. (Mail: 733 W. Maple St., North Canton, Ohio)

CENTRAL ILLINOIS CHAPTER

Chairman—C. W. Russell, Purch. Dept., Caterpillar Tractor Co., (Mail: 502 Indiana St., Morton, Ill.)

Vice-Chairman—Robert E. Dickison, Asst. to Mgr., Brass Foundry Co., 713 S. Adams St., Peoria 2, Ill.

Secretary-Treasurer—Burton L. Bevis, Fdy. Tng. Supv., Caterpillar Tractor Co., 600 W. Washington St., Peoria 8, Ill.

Directors—Terms Expire 1951

E. J. Burns, Pres., Illini Foundry Co., 7100 S. Adams St., Peoria, Ill.

C. B. Soper, Treas., American Fdy. & Furnace Co., Bloomington, Ill.

Charles W. Bucklar, Jr., Supt., Superior Foundry Co., 151 Herschel St., East Peoria, Ill.

Directors—Terms Expire 1952

B. W. Branson, Purch. Agt., Peoria Malleable Castings Co., (Mail: 410 Homestead St., Peoria, Ill.)

Henry F. Cakora, Owner, Tazewell Machine Works, 1411 N. Second St., Pekin, Ill.

Directors—Terms Expire 1953

Luther G. Gunn, Fdy. Gen. Fmn., Caterpillar Tractor Co., (Mail: 907 Bigelow St., Peoria, Ill.)

George W. Schuller, Supt., Ptn. Shops, Caterpillar Tractor Co., East Peoria, Ill.

CENTRAL INDIANA CHAPTER

Chairman—Allen J. Reid, Sls. Mgr., General Refractories Co., 620 Board of Trade Bldg., Indianapolis 4.

Vice-Chairman—Robert Spurgin, III, Fdy. Supt., Swayne Robinson & Co., 200-300 Main St., Richmond, Ind.

Secretary—Fred E. Kurtz, Met., Electric Steel Castings Co., (Mail: 39 E. 9th St., Apt. 204, Indianapolis)

Treasurer—Ray Fickenworth, Sales, Indiana Products Co., (Mail: 4901 Hillside Ave., Indianapolis)

Directors—Terms Expire 1951

Fred Carl, Met., Allison-Bedford Foundry, General Motors Corp., Bedford, Ind.

(Continued on Next Page)

CENTRAL INDIANA CHAPTER (CONTINUED)

Directors—Terms Expire 1951 (Cont'd)

Paul Hargitt, Sr., Pres., Light Metals, Inc., 1100-1198 E. 24th St., Indianapolis.

Carl P. Schopp, Fdy. Supt., Link Belt Co., 220 S. Belmont Ave., Indianapolis.

Wm. Ziegelmueller, Vice-Pres. & G. M., Electrical Steel Castings Co., Speedway City, Ind.

Directors—Terms Expire 1952

James A. Barrett, Fdy. Supt., Natl. Mall. & Steel Castings Co., (Mail: 1521 Herchell Ave., Indianapolis)

Robert Langsenkamp, Secy., Langsenkamp-Wheeler Brass Works, Inc., 1234 Shelby St., Indianapolis.

Don Moore, Vice-Pres., C & G Foundry & Pattern Works.

Louis Stevens, Pres., L. Stevens & Son, Inc., 916 E. Michigan St., Indianapolis 2.

Directors—Terms Expire 1953

Jean Danenfelser, Asst. Gen. Fdy. Supt., International Harvester Co., (Mail: 3014 E. Troy Ave., Beech Grove, Ind.)

Dallas Lunsford, Plant Mgr., Perfect Circle Corp., New Castle, Ind.

E. G. Richardson, Supt., Delco Remy Div., General Motors Corp., Columbus Ave., Plant 5, Anderson, Ind.

S. Franklin Swain, Purch. Agent, Golden Foundry, Inc., 1616 Tenth St., Columbus, Ind.

CENTRAL MICHIGAN CHAPTER

Chairman—Jack F. Secor, Field Repr., Hill & Griffith Co., (Mail: 1249 Grant St., Niles, Mich.)

Vice-Chairman—David E. Sherman, Plt. Mgr., Engrg. Castings, Inc., (Mail: 619 E. Prospect, Marshall, Mich.)

Secretary-Treasurer—Thomas T. Lloyd, Vice-Pres., Albion Malleable Iron Co., Albion, Mich.

Directors—Terms Expire 1951

Collins L. Carter, Pres. & Gen. Mgr., Albion Malleable Iron Co., Albion, Mich.

Fitz Coghlin, Jr., Met., Albion Malleable Iron Co., Albion.

C. W. Dock, Pres. & Mgr., Dock Foundry Co., 428 Fourth St. Three Rivers, Mich.

George Petredean, Treas., Calhoun Foundry Co., (Mail: R. F. D., Homer, Mich.)

Directors—Terms Expire 1952

B. J. Abbott, Pres. & Gen. Mgr., Gale Mfg. Co., Albion, Mich.

Robert Shannon, Fact. Supt., E. W. Bliss Co. (Mail: 1004 E. State St., Hastings, Mich.)

W. W. Stout, Sls. Mgr., Marshall Furnace Co., Marshall, Mich.

Directors—Terms Expire 1953

Palmer B. Coombs, Pres., Riverside Fdy. & Galvanizing Co., 501 Harrison St., Kalamazoo, Mich.

M. B. Fiandt, Partner, Superior Brass & Alum. Casting Co., 326 S. Hosmer St., Lansing, Mich.

Richard K. Moore, Gen. Mgr., Foundries Materials Co., (Mail: 256 N. Hudson St., Coldwater, Mich.)

CENTRAL NEW YORK CHAPTER

Chairman—David Dudgeon, Jr., Plant Engr., Utica Radiator Co., (Mail: R. D. No. 1, Box 119, Utica, N.Y.)

Vice-Chairman—Wm. D. Dunn, Asst. to Pres., Oberdorfer Foundries (Mail: 432 Buckingham Ave., Syracuse)

Secretary—Don J. Merwin, Vice-Pres., Oriskany Malleable Iron Co., 1431 Genesee St., Utica, N. Y.

Treasurer—J. Francis Dobbs, Met., New York Air Brake Co., (Mail: 317 Butterfield Ave., Watertown, N.Y.)

Directors—Terms Expire 1951

Joseph Gibson, Supt., Sweets Foundry, Inc. (Mail: 582 Riverside Drive, Johnson City, N.Y.)

R. A. Minnear, Fdy. Supt., Ingersoll Rand Co., Inc., Painted Post, N.Y.

R. C. S. Potter, Gen. Mgr., Chemung Foundry, Erie St., Elmira, N.Y.

Directors—Terms Expire 1952

Harold Boardman, Asst. Mgr., Elmira Works, General Electric Co. (Mail: 1226 W. Water St., Elmira, N.Y.)

C. M. Fletcher, Supt., Fairbanks Co., (Mail: 111 Prospect St., Endicott, N.Y.)

James O. Ochsner, Fdy. Chem., Crouse Hinds Co. (Mail: 226 Cleveland Ave., Syracuse 8)

Directors—Terms Expire 1953

Bruce R. Artz, Dist. Mgr., Pangborn Corp., 807 Syracuse Kemper Ins. Bldg., Syracuse.

George E. Hochgesang, Fdy. Supt., Straight Line Fdy. & Machine (Mail: R.F.D. No. 3, Syracuse)

J. F. Livingston, Asst. Plt. Engr., Crouse-Hinds Co., 109 Hobart Ave., Syracuse 5.

CENTRAL OHIO CHAPTER

Chairman—Daniel E. Krause, Exec. Dir., Gray Iron Research Institute, 1532 Cardiff Road, Columbus 12.

Vice-Chairman—Wm. T. Bland, Supt., Commercial Steel Castings Co., (Mail: 550 S. Vine St., Marion, Ohio)

Secretary—C. T. Greenidge, Supv., Battelle Memorial Institute, 505 King Ave., Columbus.

Treasurer—C. Wm. Gilchrist, Fdy. Supt., Cooper-Bessemer Corp., (Mail: 41 Mansfield Ave., Mt. Vernon, Ohio)

Directors—Terms Expire 1951

Frank Schneider, Fmn., Jeffrey Mfg. Co., (Mail: 1229 Linwood Ave., Columbus 6)

Robert A. Willey, Met., Comm. Steel Csts. Co. (Mail: 276 Clover Ave., Marion, Ohio)

Walter L. Deutsch, Sls. Engr., Columbus Malleable Iron Co., 760 Curtis Ave., Columbus 3.

Wilfred White, Met., Jackson Iron & Steel Co., Jackson, Ohio.

Directors—Terms Expire 1952

E. W. Claar, Sales, Eastern Clay Products, Inc., Jackson, Ohio.

Ray Meyer, Sand Supv., Ohio Steel Foundry Co., (Mail: 124 Englewood Road, Springfield, Ohio)

J. Howard Morgan, Gen. Mgr., Cedar Heights Clay & Coal Co., Box 366, Oak Hill, Ohio.

Directors—Terms Expire 1953

Thomas M. Cusack, Met., The Oliver Corp., (Mail: 439 Lawnview Ave., Springfield, Ohio)

E. M. Durstine, Mgr., Keener Sand & Clay Co., 515 Hartman Bldg., Columbus.

J. R. Kanengeiser, Vice-Pres., Ohio Malleable Iron Co., Columbus 16.

J. Gray Lummis, Dist. Mgr., A. P. Green Fire Brick Co., (Mail: 1865 Chatfield Road, Columbus 12)

CHESAPEAKE CHAPTER

Chairman—A. A. Hochrein, Dist. Mgr., Federated Metals Div., American Smelting & Refining Co., Highland & Eastbourne Aves., Baltimore 24.

Vice-Chairman—Allen S. Kittrell, Owner, The Leach Pattern Shop, 227 Holliday St., Baltimore 2.

Secretary-Treasurer—C. A. Robeck, Supt., & Vice-Pres., Gibson & Kirk Co., (Mail: 193 Duke of Gloucester St., Annapolis, Md.)

Technical Secretary—Wm. H. Baer, Assoc. Met., Naval Research Laboratory, Bellevue, Washington 20, D. C.

Directors—Terms Expire 1951

L. H. Denton, Mgr., Baltimore Convention Bureau, 201 Title Bldg., Baltimore 2.

Frank B. Gately, Vice-Pres. & Gen. Mgr., Fdy. Div., Flynn & Emrich Co., (Mail: Grantley Rd. & Western Maryland RR, Baltimore 15, Md.)

Wm. H. Holtz, Supt., American Brake Shoe Co., 2001-23 Winchester St., Baltimore 17.

Directors—Terms Expire 1952

T. B. Belfield, Pres., Cochrane Foundry, Inc., Ogontz & Prospect Sts., York, Pa.

Blake M. Loring, Sr. Met., Head, Non-Ferrous Section, U.S. Naval Research Laboratory, Bellevue, Washington 20, D.C.

C. D. Galloway, Fdy. Supt., Chambersburg Engineering Co., Chambersburg, Pa.

Directors—Terms Expire 1953

J. B. Mentzer, Secy.-Treas., Wood-Embly Brass Co., Waynesboro, Pa.

John W. Mentzer, Partner, Lancaster Foundry Supply Co., 211 Manheim Ave., Lancaster, Pa.

Eugene H. Ryer, Supt., James J. Lacy Co. (Mail: Glyndon, Md.)

CHICAGO CHAPTER

Chairman—C. V. Nass, Vice-Pres., Pettibone-Mulliken Corp., 4710 W. Division St., Chicago 51.

Vice-Chairman—Walter E. Moore, Wks. Mgr., Burnside Steel Fdy. Co., 1300 E. 92nd St., Chicago 19.

Secretary-Treasurer—George J. Biddle, Secy., Illinois Clay Products Co., 208 S. LaSalle St., Chicago 4.

Directors—Terms Expire 1951

Martin G. Dietl, Crane Co., (Mail: 9733 S. 51st Ave., Oak Lawn, Ill.)

Roy Frazier, Ogden Foundry, Inc., 5904 Ogden Ave., Cicero, Ill.

Lave G. Gustafson, Continental Fdy. & Mach. Co., 7315 Olcott, Hammond, Ind.

Fred B. Skeates, Fdy. Supt., Link-Belt Co., 8032 S. Rhoades, Chicago 19.

Directors—Terms Expire 1952

Adrian C. Den Breejen, Fdy. Supt., Nichol-Straight Foundry Co., 3174 Archer Ave., Chicago 8.

Chester K. Faunt, Wks. Mgr., Christensen & Olsen Foundry Co., 218 N. Racine Ave., Chicago 7.

Harry J. Jacobson, Owner, Industrial Pattern Works, 2621 Belmont Ave., Chicago 18.

John H. Owen, Asst. Dist. Sls. Mgr., Harbison Walker Refractories Co., 53 W. Jackson Blvd., Chicago 4.

Directors—Terms Expire 1953

E. E. Henry, Fdy. Supt., Hammond Brass Works, Summer St., Hammond, Ind.

W. D. McMillan, Met., International Harvester Co., (Mail: 4527 N. Wolcott, Chicago 40)

John A. Rassenfoss, Res. Met., American Steel Foundries, (Mail: 4133 Northcote Ave., East Chicago, Ind.)

Cecil F. Semrau, Met., Illinois Malleable Iron Co., 1801 Diversey Parkway, Chicago 14.

CINCINNATI DISTRICT CHAPTER

Chairman—Martin E. Rollman, Engr., Cincinnati Milling Machine Co., Marburg Ave., Cincinnati 9.

Vice-Chairman—A. W. Schneble, Jr., Plt. Mgr., The Advance Foundry Co., 107 Seminary Ave., Dayton 3, Ohio.

Secretary—B. A. Genthe, Mgr., S. Obermayer Co., 647 Evans St.

Treasurer—H. R. Rost, Slsmn., Semet-Solvay Div., Allied Chemical & Dye Corp., 723 Dixie Terminal, Cincinnati.

Assistant Treasurer—Harry R. Shick, Jr., Pres., The Ranson & Orr Co., 711 Dixie Terminal Bldg., Cincinnati 2.

Directors—Terms Expire 1951

F. W. Dixon, Vice-Pres. & G.M., Haven Malleable Castings Co., Dane & Knowlton Sts., Cincinnati 23.

Geo. A. Euskirchen, Pres., Cincinnati Foundry Co., 238 W. Mitchell Ave., Cincinnati.

Martin E. Rollman, Engr., Cincinnati Milling Machine Co.

A. W. Schlegel, Mgr., Ideal Pattern Works, Murray Road & Big 4 RR., St. Bernard, Ohio.

B. A. Genthe, Mgr., S. Obermayer Co., 647 Evans St., Cincinnati 4.

R. S. Whitehead, Field Eng., Electro Refractories & Alloys, 3036 Portsmouth Ave., Cincinnati 8.

Directors—Terms Expire 1952

Thos. H. Erhart, Vice-Pres., Cris Erhart Fdy. & Mach. Co., 1237 W. Sixth St., Cincinnati.

John F. Kahles, Assoc. Prof., Metallurgical Engineering Dept., University of Cincinnati, Cincinnati 21.

C. W. Maier, Wks. Mgr., G.H.R. Div. of Dayton Mall. Iron Co., 400 Dietrick St., Dayton 1, Ohio.

Clifford Morningstar, Asst. Fdy. Supt., Black-Clawson Co., (Mail: 818 Ridgelawn Ave., Hamilton, Ohio).

William Oberhelman, Oberhelman Ritter Foundry Co., 3323 Coleraine Ave., Cincinnati.

H. R. Rost, Slsmn., Semet-Solvay Div., Allied Chemical & Dye Corp., 723 Dixie Terminal, Cincinnati.

Directors—Terms Expire 1953

Walter Ebersold, Fmn., Reliable Castings Corp., 3530 Spring Grove Ave., Cincinnati.

William Gilbert, Jr., Pres., Buckeye Foundry Co., 2800 Beekman St., Cincinnati 25.

Harry F. Greek, Hill & Griffith Co., 1262 State Ave., Cincinnati 4.

Directors—Terms Expire 1953 (Cont'd)

A. W. Schneble, Jr., Plt. Mgr., Advance Foundry Co., 107 Seminary Ave., Dayton 3, Ohio.

Harry R. Shick, Jr., Pres., Ranson & Orr Co., 711 Dixie Terminal Bldg., Cincinnati 2.

James Whitmer Walther, Mltg. Supv., Dayton Steel Foundry Co., P.O. Box 1022, Dayton 1, Ohio.

DETROIT CHAPTER

Chairman—Jess Toth, Secy., Harry W. Dietert Co., (Mail: 15516 Mansfield, Detroit 27).

Vice-Chairman—Vaughan C. Reid, Vice-Pres., City Pattern Fdy. & Mach. Co., 1161 Harper Ave., Detroit 11.

Secretary—Michael Warchol, Met., Atlas Fdy. Co., 131 S. Livernois St., Detroit 17.

Treasurer—Eugene J. Passman, Met., Frederic B. Stevens, Inc., 1800–18th St., Detroit.

Directors—Terms Expire 1951

Alexander A. Andrews, Buyer, Pontiac Motor Div., G.M.C., Pontiac, Mich.

G. T. Baebler, Core Oil Repr., Penola, Inc., P.O. Box 67, River Rouge Station, Detroit.

Robert F. Thomson, International Nickel Co., 5-223 General Motors Bldg., Detroit.

John D. Schmeig, Pres., Schmeig Industries Inc., 308 Piquette Ave., Detroit 2.

Directors—Terms Expire 1952

Ralph W. Barker, Met., Wilson Fdy. & Mach. Co., Pontiac.

H. E. Gravlin, Met., Ford Motor Co. (Rouge Plant) (Mail: 25021 Roycourt, Huntington Woods, Mich.)

W. E. Kidwell, Asst. Fdy. Met., Packard Motor Car Co., (Mail: 2648 Rochester Ave., Detroit).

Crary Davis, Chief Met., Aluminum Co. of America, 3311 Dunn Road, Detroit.

Directors—Terms Expire 1953

C. W. Hockman, Cadillac Motor Car Div., GMC, (Mail: 16-66 Rosemont Road, Detroit 19.

Lanson H. Kinney, Ptrn. Engr., Dodge Main Plant Chrysler Corp., (Mail: 4651 Jos. Campau, Detroit 7).

John J. Watson, Detroit Repr., C. O. Bartlett & Snow Co., (Mail: 2457 Woodward, Detroit).

H. G. McMurry, Production Foundry Office, Ford Motor Co., Dearborn, Mich.

EASTERN CANADA CHAPTER

Chairman—L. Guilmette, Treas., Canadian Fdy. Supplies & Equip. Co., Ltd., 4295 Richlieu St., Montreal, Que.

Vice-Chairman—W. Turney Shute, Canadian Car & Fdy. Co., 204 Cote St. Antoine Road, Westmount, Que., Canada.

Secretary—Alfred H. Lewis, Met., Dominion Engineering Works, Ltd., P.O. Box 220, Montreal, Que., Canada.

Treasurer—M. E. Fee, Tech. Repr., Canada Starch Sales Co., Ltd., 1940 Sun Life Bldg., Montreal, Que., Canada.

Directors—Terms Expire 1951

H. T. Doran, Eastern Repr., Whiting Corp., (Canada) Ltd., New Birks Bldg., Room 515, Montreal, Que., Canada.

A. Jack Moore, Dist. Mgr., Montreal Bronze, Ltd., 999 Delorimier Ave., Montreal, Que., Canada.

Paul Drolet, La Cie. F. X. Drolet, Ltee., Quebec City, Que., Canada.

Alex Watson, Fmn., Canadian National Railways Fdy., Leber St., Pt. St. Charles, Montreal, Que., Canada.

Lucien Beaudry, Factory Engr., Warden King, Ltd., 2104 Bennett Ave., Montreal, Que., Canada.

Directors—Terms Expire 1952

Marc Chicoine, Met., Robert Mitchell Co., Ltd., 64 Monkland Blvd., Villa St. Laurent, Que., Canada.

Norman C. MacPhee, Met., Bureau of Mines, 552 Booth St., Ottawa, Ont., Canada.

Neil E. Prunier, Montreal Technical School, 200 Sherbrooke W., Montreal, Que., Canada.

W. C. Rowe, Fdy. Tech., Crane Ltd., 3800 St. Patrick St., Montreal, Que., Canada.

E. C. Winsborrow, Vice-Pres., Shawinigan Foundries, Ltd., Shawinigan Falls, Que., Canada.

(Continued on Next Page)

EASTERN CANADA CHAPTER (CONTINUED)

Directors—Terms Expire 1953

J. G. Hunt, Asst. Fdy. Supt., Dominion Engineering Wks., Ltd., P.O. Box 220, Montreal, Que., Canada.

George C. Jarvis, Ind. Slsmn., LaSalle Coke Co., 660 St. Catherine St., W. Montreal 2, Que., Canada.

W. C. Perrot, Supt., Canada Iron Foundries, Ltd., 921 Sun Life Bldg., Montreal, Que., Canada.

Paul B. Savoie, Slsmn., Webster & Sons, Ltd., 724 Canada Cement Bldg., Montreal, Que., Canada.

Ray Schwartz, Fdy. Fmn., Lunenburg Fdy. Co., Ltd., Lunenburg, N.S., Canada.

EASTERN NEW YORK CHAPTER

Chairman—Leo M. Scully, Mgr., Scully Foundry & Machine Co., 66 S. River St., Coxsackie, N. Y.

Vice-Chairman—John E. Waugh, General Electric Co., Bldg. 99, Schenectady, N. Y.

Secretary-Treasurer—Leigh M. Townley, Asst. Met., Adirondack Fdries. & Steel Inc., Shaker Road, Watervliet, N.Y.

Directors—Terms Expire 1951

R. A. Garrison, Vice-Pres. & G.M., Adirondack Foundries & Steel Co., Shaker Road, Watervliet, N.Y.

P. C. Wilson, Supt., James Hunter Machine Co., North Adams, Mass.

Kenneth F. Echard, Met., Eddy Valve Co., South St., Waterford, N.Y.

Directors—Terms Expire 1952

Myers Henderer, Jr., Fdy. Supt., Watervliet Iron & Brass Fdy., Inc., Elm St. & Chohoes Road, Watervliet, N.Y.

John M. Jones, Fdy. Met., American Locomotive Co. (Mail: 1192 Barkwood Blvd., Schenectady, N.Y.)

Directors—Terms Expire 1953

Scott Mackay, Prof. Met. Engrg., Rensselaer Polytechnic Institute. (Mail: 2115 Burdett Ave., Troy, N. Y.)

Lee Martin, Branch Mgr., Northern Indiana Brass Co., Nibco of New York Div., 50 Harrison Ave., South Glens Falls, N.Y.

R. N. Williams, Slsmn., Geo. F. Pettinos, Inc., (Mail: Box 177, Granville, N.Y.)

METROPOLITAN CHAPTER

Chairman—D. S. Yeomans, Sales & Serv. Repr., Geo. F. Pettinos, Inc., (Mail: P.O. Box No. 1, East Orange, N.J.)

Vice-Chairman—D. Frank O'Connor, Pres., O'Connor's Foundry, Inc., Hackettstown, N.J.

Secretary—J. Fred Bauer, Slsmn., Hickman, Williams & Co., 70 Pine St., New York 5.

Treasurer—Dan Polderman, Jr., Vice-Pres. & Exp. Mgr., Whiting Corp., 30 Church St., New York 7.

Directors—Terms Expire 1951

George Baer, Vice-Pres., Atlas Stainless Steel Castings, Div., Atlas Foundry Co., 517-533 Lyons Ave., Irvington, N.J.

Walter Hartl, Treas., American Aluminum Casting Co., 324 Coit St., Irvington, N.J.

Wm. H. Ruten, Assoc. Prof., Industrial Process Dept., Polytechnic Institute of Brooklyn, 85 Livingston St., Brooklyn 2, N.Y.

Howard E. Voit, Slsmn., Sterling Wheelbarrow Co., 25 W. 43d St., New York 18.

T. J. Wood, Asst. Wks. Mgr., Brake Shoe & Castings Div., American Brake Shoe Co., 230 Park Ave., New York 17.

Geo. F. Watson, Asst. Chief Chem., American Brake Shoe Co., Metallurgical Laboratory, Mahwah, N.J.

Directors—Terms Expire 1952

John Bing, Gen. Mgr., Metropolitan Refractories Corp., 15 Park Row, New York 7.

Herbert J. Cooper, 336 Harding Drive, South Orange, N.J.

John Fecko, Gray Iron Fdy. Supt., Worthington Pump & Machinery Corp., Harrison, N.J.

William L. Hutton, Fdy. Supt., T. Shriver & Co., Inc., 808-864 Hamilton St., Harrison, N.J.

Carl Szego, Moldcast Products, Inc., 68 Clifford St., Newark.

MEXICO CITY CHAPTER

Chairman—Ing. Fernando Gonzalez Vargas, Consulting Met., 2 Da. Privada Concepcion Beistegui No. 14, Mexico, D.F.

Vice-Chairman—Delbert Luper, Luz Savinon No. 1211, Apt. 32, Mexico, D. F.

Secretary-Treas.—N. S. Covacevich, Apartado 1030, Mexico, D. F.

Directors—Terms Expire 1952

Luis Delgado-Vega, Irolo 124 Zacahuizco, Mexico, D.F.

Isidro Lopez Llorente, Industrias Mexicanas El Nervion, S.A., (Mail: Iztaccihuati 15-Dep., 5 Col. Hipodromo, Mexico, D.F.)

Juan Latapi Sarre, Fundiciones De Hierro Y Acero, S.A., (Mail: Mirto No. 25, Ciudad, Mexico, D.F.)

MICHIANA CHAPTER

Chairman—Wm. Ferrell, Gen Wks. Supt., Auto Specialties Mfg. Co., St. Joseph, Mich.

Vice-Chairman—Stanley F. Krzeszewski, Fact. Mgr., American Wheelabrator & Equip. Corp., Mishawaka, Ind.

Secretary-Treasurer—V. C. Bruce, Slsmn., Frederic B. Stevens, Inc., (Mail: 1504 Lawndale Road, Elkhart, Ind.)

Directors—Terms Expire 1951

Noel A. Baker, Sales Mgr., Star Pattern & Mfg. Co., 382 W. Main St., Benton Harbor, Mich.

John Hager, Prod. Engr., Columbia Castings Co., 622½ Columbia, South Bend, Ind.

H. T. Lewis, Sales Engr., Harbison Walker Refr. (Mail: 7601 E. End Ave., Chicago 49.)

Andrew Peterson, Mall. Fmn., Chg. of Melting, Oliver Farm Equipment Co., (Mail: Route 4, Box 640, South Bend)

V. S. Spears, Sales Engr., American Wheelabrator & Equip. Corp. (Mail: 2013 Linden Ave., Mishawaka, Ind.)

E. S. Wegenke, Gen. Labor Fmn., Sibley Machine & Foundry Corp., (Mail: 1524 N. College St., South Bend, 16, Ind.)

Directors—Terms Expire 1952

Harry D. Hunt, Fdy. Supt., Auto Specialties Mfg. Co., Graves St., St. Joseph, Mich.

C. H. Ker, Gen. Supt., Dalton Foundries, Inc., Lincoln & Jefferson Sts., Warsaw, Ind.

Lewis D. Reiff, Asst. G. M. Supv., Steel & Malleable Castings Co., (Mail: 1074 Pearl St., Benton Harbor, Mich.)

D. R. Craft, Purchasing, Allis-Chalmers Mfg. Co., 1001 Lincoln Way, La Porte, Ind.

Directors—Terms Expire 1953

Matthew Goodall, Jr., Fdy. Supt., Dodge Mfg. Corp., 500 S. Union St., Mishawaka, Ind.

Roy A. Payne, Mgr., The Sterling Brass Foundry, 1640 Sterling Ave., Elkhart, Ind.

Leslie Pugh, Fdy. Supt., Casting Service Corp., La Porte, Ind.

Kent B. Wonnell, Supt., Peru Fdy. Co., Box 17, Peru, Ind.

MO-KAN CHAPTER

Chairman—W. Leslie Neville, Pres., Neville Foundry Co., Inc., 1901 Armour, N. Kansas City, Mo.

Vice-Chairman—Henry C. Deterding, Met., Sonken Galamba Corp., Second & Riverview, Kansas City, Kansas.

Secretary—J. S. Weeks, Plant Supt., Independence Stove & Furnace Co., Hayward & Cottage St., Independence, Mo.

Treasurer—H. P. Schwickrath, Prier Brass Mfg. Co., 7719 E. 15th, Kansas City, Mo.

Directors—Terms Expire 1951

R. A. Frick, Supt., Brake Shoe & Castings Div., American Brake Shoe Co., 1501 Macon St., N. Kansas City 16, Mo.

Milton B. Gold, Partner, Gold Foundry & Machine Works, 1618 S. Osage, Independence, Mo.

J. T. Westwood, Jr., Pres., Blue Valley Foundry Co., 7011 E. 12th St., Kansas City 3, Mo.

Directors—Terms Expire 1952

E. C. Austin, Jr., Vice-Pres. & G.M., National Aluminum & Brass Fdy., 1311 W. Elm, Independence, Mo.

Alan G. Linley, Chem. Engr., Locomotive Finished Material Co., (Mail: 620 N. Third, Atchison, Kansas)

Directors—Terms Expire 1953

John F. Redman, Jr., Redman Pattern Works, 7011 E. 12th St., Kansas City, Mo.

E. C. Sooy, Secy.-Treas., Kansas City Hay Press Co., 801 Woodswether Road, Kansas City 6, Mo.

NORTHEASTERN OHIO CHAPTER

President—Fred J. Pfarr, Plant Mgr., Lake City Malleable Co., (Mail: Park Drive, Lake Lucerne, Chagrin Falls, Ohio)

Vice-President—Gilbert J. Nock, Vice-Pres., The Nock Fire Brick Co., 1243 E. 55th St., Cleveland 14.

Secretary—A. J. Harlan, Sales, Hickman-Williams & Co., 1151 Union Commerce Bldg., Cleveland.

Treasurer—F. Ray Fleig, Pres., Smith Facing & Supply Co., 1857 Carter Road, Cleveland 13.

Directors—Terms Expire 1951

Lewis T. Crosby, Dist. Mgr., Sterling Wheelbarrow Co., (Mail: 1836 Euclid, Cleveland)

Maurice F. Degley, Engr., Ferro Machine & Foundry Co., 3155 E. 66th St., Cleveland 4.

Wm. G. Gude, Mng. Editor, *Foundry*, Penton Bldg., Cleveland 13.

Lloyd W. Leeseberg, Supt., Superior Foundry, Inc., 3671 W. 148th St., Cleveland.

Leslie Schuman, Gen. Supt., National Mall. & Steel Castings Co., 10600 Quincy Ave., Cleveland 6.

John A. Sharritts, Fdy. Supt., Westinghouse Elec. Co., (Mail: Box 5817, Cleveland)

Directors—Terms Expire 1952

Howard E. Heyl, Sales, The Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5.

Henry Macler, Gen. Supt., Sterling Foundry Co., (Mail: 409 S. Main, Wellington, Ohio)

Richard L. Pope, Wks. Mgr., Electro-Alloys Div., American Brake Shoe Co., Elyria, Ohio.

Peter Rettig, Owner, Rettig Pattern Co., 5518 Euclid Ave., Cleveland, Ohio.

Charles F. Seelbach, Jr., Plant Engr., Forest City Foundries Co., (Mail: 1188 Wagar Road, Rocky River, Ohio)

Directors—Terms Expire 1953

R. J. Hines, Vice-Pres. & Mgr., Hines Flask Co., 3431 W. 140th St., Cleveland 11.

S. E. Kelly, Asst. Mgr., Eberhard Manufacturing Co., 2731 Tennyson Road, S. E. Cleveland 4.

Jack Kroecker, Supt., Sand Foundry, Aluminum Co. of America, 2210 Harvard, Cleveland.

Michael C. Ross, Pres., Bellville Foundries, Inc., Markey St., Bellville, Ohio.

C. F. Walton, Met., Engineering Dept., Case Institute of Technology, University Circle, Cleveland.

NORTHERN CALIFORNIA CHAPTER

President—John R. Russo, Gen. Mgr., Russo Foundry Equipment Co., 7315 Holly St., Oakland 3, Calif.

Vice-President—Philip C. Rodger, Fmn., General Metals Corp., (Mail: 5839 Mendocino Ave., Oakland 18, Calif.)

Secretary—Davis Taylor, Dist. Repr., Amer. Wheelabrator & Equip. Co. (Mail: Northern California Chapter, A.F.S, 90 Second St., San Francisco 5)

Treasurer—Fred A. Mainzer, Mgr., Pacific Brass Fdy. of S. F., 251 Second St., San Francisco 5.

Directors—Terms Expire 1951

Arnold Boscacci, Owner, American Brass & Iron Foundry, (Mail: 4433 Sequoyah Road, Oakland 5, Calif.)

Milton Oakes, Asst. Fdy. Fmn., Amer. Manganese Steel Div., (Mail: 1538—76th Ave., Oakland 21, Calif.)

Paul G. Jordan, Prod. Mgr., Vulcan Foundry Co., (Mail: 1400 Allendale Ave., Oakland 19, Calif.)

George W. Stewart, Owner, East Bay Brass Foundry, 1200 Chesley Ave., San Pablo, Calif.

Directors—Terms Expire 1952

Donald C. Caudron, Prod. Supt., Pacific Brass Foundry, 251 Second St., San Francisco 5.

W. S. Gibbons, Ridge Foundry, 688 Williams St., San Leandro, Calif.

Elgo Sabatini, Asst. Gen. Mgr., General Metals Corp., 701 105th Ave., Oakland 3, Calif.

J. M. Snyder, Engr., Jos. Musto Sons, Keenan Co., Abrasive Div., (Mail: 1446—55th Ave., Oakland 21, Calif.)

NORTHERN ILLINOIS-SOUTHERN WISCONSIN CHAPTER

Chairman—F. W. Thayer, Asst. Wks. Mgr., Gunite Foundries Corp., 302 Peoples Ave., Rockford, Ill.

Vice-Chairman—Carl L. Dahlquist, Fdy. Tech., Greenlee Bros. & Co., (Mail: 120 S. Highland Ave., Rockford, Ill.)

Secretary—Jack Rundquist, Co-owner, Beloit Casting Co., Beloit, Wis.

Treasurer—Martin Putz, Fdy. Supt., Fairbanks Morse & Co., Henderson Ave., Freeport, Ill.

Directors—Terms Expire 1951

John Clausen, Fdy. Engr., Greenlee Bros. & Co., 2136 Twelfth St., Rockford, Ill.

L. K. Greenberg, Treas., Rockford Brass Works, Rockford, Ill.

Ralph M. Lightcap, Mgr., Rupp Pattern Co., 1302 Harrison Ave., Rockford, Ill.

Directors—Terms Expire 1952

H. J. Bauman, Beloit Iron Works, (Mail: 2319 Elm St., Rockford, Ill.)

Chas. N. Deubner, Fdy. Supt., Yates American Machine Co., Beloit, Wis.

Robert Pottinger, Arnold Engineering Co., Marengo, Ill.

Directors—Terms Expire 1953

Lester C. Fill, Fdy. Supt., George D. Roper Corp., Blackhawk Park Ave., Rockford, Ill.

L. T. Manley, Partner, Manley Sand Co., Rockton, Ill.

H. W. Miner, Gen. Supt. of Fdries., Fairbanks Morse & Co., Manufacturing Div., Beloit, Wis.

NORTHWESTERN PENNSYLVANIA CHAPTER

Chairman—Frank P. Volgstadt, Asst. Plt. Mgr., Griswold Mfg. Co., (Mail: 501 Beverly Drive, Erie, Pa.)

Vice-Chairman—J. D. James, Fdy. Supt., Cooper-Bessemer Corp., Grove City, Pa.

Secretary—Earl M. Strick, Fin. Supt., Erie Malleable Iron Co., (Mail: 629 Beverly Drive, Erie, Pa.)

Treasurer—Fred J. S. Carlson, Fdy. Fmn., Weil-McLain Co., (Mail: 1136 E. 8th St., Erie, Pa.)

Directors—Terms Expire 1951

Clyde E. Cooper, Fdy. Supt., Keystone Brass Works, (Mail: 1311 Powell Ave., Erie, Pa.)

Harold G. Lolley, Fdy. Supt., Bucyrus-Erie Co., P.O. Drawer 800, Erie, Pa.

J. Marcus Morrison, Fdy. Supt., U. S. Radiator Corp., (Mail: 109 Temple, Fredonia, N.Y.)

Jos. A. Shuffstall, Plant Mgr., National Erie Corp., (Mail: 711 Colorado Drive, Erie, Pa.)

Directors—Terms Expire 1952

Charles F. Gottschalk, Vice-Pres., Cascade Foundry Co., 1902 Plum St., Erie, Pa.

C. C. Hahn, Fdy. Supt., National Transit Pump Co., (Mail: Box 48, Seneca, Pa)

W. H. Piper, Fdy. Supt., Erie Bronze Co., Erie, Pa.

Directors—Terms Expire 1953

C. S. Ban, Plt. Mgr., National Bearing Div., American Brake Shoe Co., (Mail: P.O. Box 458, Meadville, Pa.)

Duane P. Davis, Urick Foundry Co., 1116 Cherry St., Erie, Pa.

Bailey D. Herrington, Serv. Tech., Hickman, Williams & Co. (Mail: 312 Euclid Ave., Erie, Pa.)

ONTARIO CHAPTER

Chairman—M. N. Tallman, Met., A. H. Tallman Bronze Co., Ltd., Cavell Ave., Hamilton, Ont., Canada.

Vice-Chairman—R. H. Williams, Supt. of Fdries., Canadian Westinghouse Co. Ltd., (Mail: 54 Paisley Ave. N., Hamilton, Ont., Canada.

Secretary-Treasurer—Gerald L. White, Adv. Mgr., Westman Publications, Ltd., 137 Wellington St. W., Toronto 1, Ont., Canada.

Directors—Terms Expire 1951

A. C. Boak, Supt. of Fdies., Non-Ferrous Casting Co., 65 Frederick St., Toronto, Ont., Canada.

A. Reyburn, Supt. of Fdies., Cockshutt Plow Co. Ltd., Brantford, Ont., Canada.

(Continued on Next Page)

ONTARIO CHAPTER (CONTINUED)

Directors—Terms Expire 1951 (Cont'd)

Jack Richardson, Wm. R. Barnes Co. Ltd., 243 Cumberland Ave., Hamilton, Ont., Canada.

J. H. King, Slsmn., Werner G. Smith Co., Ltd., 200 Fairbanks Ave., Toronto 10, Ont., Canada.

John Perkins, Asst. Gen. Supt., Fdy. & Heat Treating, Ford Motor Co. of Canada Ltd., Windsor, Ont., Canada.

Directors—Terms Expire 1952

Charles Johnston, Fdy. Supt., E. Long Ltd., 100 Front St. S., Orillia, Ont., Canada.

Alex Pirrie, Gurney Foundry Co., Ltd., 4 Junction Road, Toronto, Ont., Canada.

O. A. Davies, Gen. Supt., The Canada Metal Co., Ltd., 721 Eastern Ave., Toronto, Ont., Canada.

Harvey Miller, Fdy. Supt., Walker Metal Products Ltd., (Mail: 2066 Vimy Ave., Windsor, Ont., Canada.

Directors—Terms Expire 1953

T. Lyons, Empire Brass Mfg. Co. Ltd., Dundas St., London, Ont., Canada.

Fred J. Rutherford, Sls. Repr., Refractories Engrg. & Supply, Ltd., 99 Clinton St. Hamilton, Ont., Canada.

Chas. Thompson, Galt Malleable Iron Co., Ltd., 60 Kerr St., Galt, Ont., Canada.

George R. Winkworth, Mgr., Toronto Foundry Co., 1884 Davenport Road, Toronto, Ont., Canada.

OREGON CHAPTER

Chairman—James T. Brodigan, Mgr., Columbia Steel Foundry (Mail: 2325 N. E. 53rd Ave., Portland 13)

Vice-Chairman—E. J. Hyche, Vice-Pres., Rich Mfg. Co. of California, (Mail: 1213 N. Russett, Portland)

Secretary-Treasurer—Wm. M. Halverson, Insp., Electric Steel Foundry Co., 2141 N.W. 25th, Portland.

Directors—Terms Expire 1951

Harold A. Story, Supt., Oregon Brass Works, 1127 S. E. 10th Ave., Portland 14.

C. Neal Wilcox, Asst. Fdy. Supt., Electric Steel Foundry Co., 2141 N.W. 25th Ave., Portland.

George C. Vann, Asst. Mgr., N. W. Foundry & Furnace Co., 2345 S. E. Gladstone, Portland 2.

Directors—Terms Expire 1952

Hugh Templeton, Slsmn., Balfour-Guthrie Co., 733 S. W. Oak, Portland 7.

Directors—Terms Expire 1953

Harry K. Emslie, Pattern Maker, Precision Pattern Works (Mail: 1643 S.W. Custer St., Portland 19)

Wm. M. Halverson, Insp., Electric Steel Foundry Co., 2141 N. W. 25th, Portland.

Henry C. Weiss, Fdy. Supt., Mobilift Corp. (Mail: 3308 S. E. Lincoln St., Portland)

PHILADELPHIA CHAPTER

Chairman—C. B. Jenni, Met., General Steel Castings Corp. (Mail: 205 DuPont St., Ridley Park, Pa.)

Vice-Chairman—George Bradshaw, Master Molder, Philadelphia Navy Yard (Mail: 1525 S. Walton St., Philadelphia)

Secretary-Treasurer—W. B. Coleman, Pres., W. B. Coleman & Co., Ninth & Rising Sun Ave., Philadelphia 40.

Directors—Terms Expire 1951

J. L. Furey, Sls. Engr., Swan Finch Oil Corp. (Mail: P.O. Box 5, Cheltenham, Pa.)

W. F. Graden, Lab. Dir., Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia.

Wm. Morley, Fdy. Mgr., Link-Belt Co., Olney Foundry Div., 180 W. Duncannon Ave., Philadelphia.

Directors—Terms Expire 1952

A. Kraft, Fdy. Mgr., Wilkening Mfg. Co., 2000 S. 71st St., Philadelphia.

C. R. Tinsley, U. S. Pipe & Foundry Co., Burlington, N.J.

Directors—Terms Expire 1953

W. Donald Bryden, Pres., Philadelphia Bronze & Brass Corp., 22nd & Master Sts., Philadelphia.

A. A. Thum, Pres., Palmyra Foundry Co., Palmyra, N.J.

QUAD CITY CHAPTER

Chairman—H. A. Rasmussen, Pres., General Pattern Corp. (Mail: 1931—34th St., Moline, Ill.)

Vice-Chairman—Wm. C. Bell, Prod. Engr., Frank Fdries. Corp. (Mail: 4529—13th Ave., Rock Island, Ill.)

Secretary-Treasurer—Robert E. Miller, Fdy. Engr., John Deere, Planter Works (Mail: 4115—7th Ave., Moline, Ill.)

Directors—Terms Expire 1951

D. DeJohn, Fdy. Supt., John Deere Dubuque Tractor Works (Mail: 2795 Hillcrest Road, Dubuque, Iowa)

E. P. Closen, Gen. Fmn., John Deere Planter Works, Moline, Ill.

C. S. Humphrey, Pres., C. S. Humphrey Co., 249—2nd St., Moline, Ill.

J. H. Nelsen, Supt., Mississippi Foundry Corp., 1700 First St., Rock Island, Ill.

Directors—Terms Expire 1952

Boyd L. Hays, Mgr., Union Malleable Iron Works, East Moline, Ill.

Russell H. Swartz, Gen. Mgr., Riverside Foundry, Inc., Bettendorf, Iowa.

P. E. Wright, Fdy. Supt., Fairbanks, Morse & Co., 11th & 14th Ave., East Moline, Ill.

Directors—Terms Expire 1953

Leslie W. Johnson, Plant Supt., Swanson Foundry Co. (Mail: 344—14th Ave., Moline, Ill.)

C. R. Marthens, Owner, Marthens Co., 309—16th St., Moline, Ill.

A. D. Matheson, Plant Mgr., French & Hecht Div., Kelsey-Hayes Wheel Co., Davenport, Iowa.

ROCHESTER CHAPTER

Chairman—Kenneth R. Proud, Fdy. Mgr., Anstice Co., Inc., 111 Humboldt St., Rochester 9, N.Y.

Vice-Chairman—Chas E. Vaughn, Supt. of Fdies., Ritter Co., Inc., P.O. Box 848, Rochester 3, N.Y.

Secretary-Treasurer—Duncan M. Wilson, Engineered Casting Div., American Brake Shoe Co., 10 Mt. Read Blvd., Rochester 11, N.Y.

Directors—Terms Expire 1951

Fred J. Gehron, Supt., American Brake Shoe Co., Southern Wheel Div., 82 Barnum St., Rochester 9, N.Y.

Wm. B. Richter, Fdy. Fmn., Gleason Works, 1000 University Ave., Rochester 3, N.Y.

Herman G. Hetzler, Pres., Hetzler Foundries, Inc., P.O. Box 302, Rochester, N.Y.

Edward J. Baker, Branch Mgr., American Smelting & Refining Co., 16 State St., Rochester.

Directors—Terms Expire 1952

C. B. Benedict, Benedict Pattern Works (Mail: 373 St. Paul St., Rochester 5)

Donald H. Rishor, Fdy. Consultant (Mail: 318 Selye Terrace, Rochester 13, N.Y.)

Donald E. Webster, Met., American Laundry Machinery Co. (Mail: 229 Elmdorf Ave., Rochester, N.Y.)

Directors—Terms Expire 1953

Leon C. Kimpal, Engr., Rochester Gas & Electric Corp., 89 East Ave., Rochester 4, N.Y.

John Racinowski, Supt., Rochester Erie Foundry Corp., 50 Dewey Ave., Rochester 6, N.Y.

Wm. B. Sattler, Sales Engr., Whitehead Brothers Co. (Mail: 90 St. Regis Drive N., Rochester 7, N. Y.)

SAGINAW VALLEY CHAPTER

Chairman—Howard H. Wilder, Chief Met., Fdy. Div., Eaton Mfg. Co. (Mail: P.O. Box No. 18, Vassar, Mich.)

Vice-Chairman—Raymond H. Klawuhn, Accountant, General Foundry & Mfg. Co., P.O. Box 119, Flint, Mich.

Secretary-Treasurer—Walter F. Bohm, Met., Buick Motor Div., GMC (Mail: 329 W. Hamilton, Flint 4, Mich.)

Directors—Terms Expire 1951

Albert E. Edwards, Gen. Fmn., Chevrolet Grey Iron Fdy., GMC (Mail: 1032 Reed St., Saginaw, Mich.)

Kester S. Carleton, Fmn., Buick Motor Div., GMC. (Mail: 507½ Avon, Flint 3, Mich.)

F. D. Haskins, Instructor, General Motors Institute, 3rd & Chevrolet Aves., Flint 2, Mich.

Directors—Terms Expire 1952

Frank A. Buike, Per. Dir., Almont Mfg. Co. (Mail: 540 N. Almont Ave., Imlay City, Mich.)

A. T. Peters, Res. Met., Dow Chemical Co. (Mail: 326 Harrison St., Midland, Mich.)

Harvey S. Durham, Chief Inspector, Chevrolet Grey Iron Fdy., GMC (Mail: 1021 N. Grange St., Saginaw, Mich.)

Directors—Terms Expire 1953

Mendel A. Fair, Owner & Gen. Mgr., Valley Steel Casting Co., Foot of 11th St., Bay City, Mich.

F. James McDonald, Engr., Central Foundry Div., GMC. (Mail: 538 Peace St., Saginaw, Mich.)

Otto J. Nickodemus, Treas., Vassar Electric Products, Inc. (Mail: 407 W. Huron Ave., Vassar, Mich.)

SOUTHERN CALIFORNIA CHAPTER

President—John E. Wilson, Met. Engr., Climax Molybdenum Co. of Mich., 650 Grand Ave., Quinby Bldg., Los Angeles 14.

Vice-President—Henry W. Howell, Pres., Howell Foundry Co., 661 Los Nietos Road, Los Nietos, Calif.

Secretary—H. G. Pagenkopp, Partner, Angelus Pattern Works, 2084 Belgrave Ave., Huntington Park, Calif.

Treasurer—A. L. Goodreau, Mgr., G-B Brass & Alum. Fdy., Inc., 2414 Santa Fe Ave., Los Angeles 58.

Directors—Terms Expire 1951

James Barr, Pres. & Gen. Mgr., Compton Foundry, 1320 S. Alameda St., Compton, Calif.

James R. Cady, Asst. Prof. of Mech. Engrg., University of Southern Calif., University Park, Los Angeles 7.

Arthur E. Falk, Partner, Centrifugal Casting Co. (Mail: 3245 Cherry Ave., Long Beach 7, Calif.)

Ray Silva, Fdy. Supt., Fairbanks, Morse & Co. (Mail: 281 E. Cucamonga, Pomona, Calif.)

Earl D. Shomaker, Patt. Shop Fmn., Kay-Brunner Steel Products Co., Alhambra, Calif.

Directors—Terms Expire 1952

K. W. Miller, Owner, K. W. Miller Patterns, 4124 Long Beach Ave., Los Angeles 11.

J. William Mitchell, Asst. Supt., Utility Steel Foundry, 3320 E. Slauson, Vernon, Calif.

Emile F. Peschke, Fdy. Supt., Reliance Regulator Div., American Meter Co., 1000 Meridian Ave., Alhambra, Calif.

R. J. Wallace, Prod. Mgr., Westlectric Castings, Inc., 2040 S. Camfield Ave., Los Angeles 22.

ST. LOUIS DISTRICT CHAPTER

Chairman—John Williamson, Slsmn., M. A. Bell Co., 217 Lombard St., St. Louis.

Vice-Chairman—Ralph M. Hill, Pres., East St. Louis Castings Co., 4200 St. Clair Ave., East St. Louis, Ill.

Secretary—Paul E. Retzlaff, Busch-Sulzer Bros., Diesel Eng. Co., Div., Nordberg Mfg. Co., 3300 S. Second St., St. Louis 18.

Treasurer—Robert H. Jacoby, Met., Key Co., P.O. Box 491, East St. Louis, Ill.

Directors—Terms Expire 1951

J. F. Gilbert, Pres., J. F. Gilbert Co., Inc., 6010 McPherson, St. Louis 21.

N. L. Peukert, Supv., Cupola Melting, Carondelet Foundry Co., 2101 S. Kingshighway Blvd., St. Louis.

Carl A. Pfanstiel, Wks. Mgr., Fulton Iron Works Co., 1209 Delaware Ave., St. Louis.

Walter A. Zeis, Foundry Supply & Equip. (Mail: No. 2 Armin, Webster Grove, Mo.)

Directors—Terms Expire 1952

Lloyd C. Farquhar, Vice-Pres., East St. Louis Casting Co., East St. Louis, Ill.

A. S. Hard, Molding Fmn., St. Louis Steel Casting Co. (Mail: 5321 Nottingham Ave., St. Louis 9)

A. L. Hunt, Wks. Mgr., National Bearing Div., American Brake Shoe Co., 4930 Manchester Ave., St. Louis 10.

Clee Shy, Fdy. Supt., Banner Iron Works (Mail: 7026 Garesche, Jennings 20, Mo.)

Directors—Terms Expire 1953

Edward R. Belton, Partner, Progressive Pattern Co. (Mail: 8018 Genesta, St. Louis 23)

C. A. Kenyon, Supt., Lewin Mathes Co. (Mail: 1631 McLaran, St. Louis)

Directors—Terms Expire 1953 (Cont'd)

Henry W. Meyer, Sand Research, General Steel Castings Co. (Mail: 5323 Lindenwood, St. Louis 9)

George N. Shepherd, R. R. No. 2, Clarksville, Mo.

TENNESSEE CHAPTER

Chairman—P. L. Arnold, Res. Mgr., U.S. Pipe & Foundry Co., 27th & Chestnut Sts., Chattanooga.

Vice-Chairman—Porter Warner, Jr., Porter Warner Ind., Inc. (Mail: P.O. Box 907, Chattanooga 1)

Secretary-Treasurer—Herman Bohr, Jr., Partner, Robbins & Bohr, Chattanooga Bank, Chattanooga.

Directors—Terms Expire 1951

Wm. P. Delaney, Pres., Eureka Foundry Co., Grove St., Chattanooga.

Charles Saunders, Tenn. Products & Chem. Corp., American National Bank Bldg., Nashville.

James L. Payne, Sales Dept., Ross-Meehan Foundries, 820 Glenwood Drive, Chattanooga.

K. L. Landgrebe, Supt., Fdy. Div., The Wheland Co. (Mail: 2205 Ringgold Road, Chattanooga)

Directors—Terms Expire 1952

D. H. L. Bealer, Supt., American Brake Shoe Co., 1814 Grove St., Chattanooga 2.

Sam C. Northington, Fdy. Supt., Combustion Engineering Co., Inc., 1032 W. Main St., Chattanooga.

Directors—Terms Expire 1953

Wm. P. Willson, Vice-Pres., Athens Plow Co., Hicks St., Athens, Tenn.

W. M. Hamilton, Mgr., Crane Co., Chattanooga Div., P.O. Box 551, Chattanooga.

TEXAS CHAPTER

Chairman—W. H. Lyne, III, Res. Engr., Hughes Tool Co. (Mail: 5623 Lawson, Houston)

Vice-Chairman—John M. Bird, Owner, American Brass Foundry, 2627 E. Lancaster, Ft. Worth.

Secretary—John M. Morris, Lone Star Steel Co., (Mail: P.O. Box 8087, Dallas 5.)

Treasurer—Robt. C. Wittlinger, Pioneer Foundry, 7419 Avenue "O", Houston 11.

Directors—Terms Expire 1951

M. J. Henley, Met., Texas Foundries, Inc., P.O. Box 180, Lufkin, Texas.

F. G. Huber, Pres., & G.M., Able Supply Co., Inc., 5220 Texas, P.O. Box 2310, Houston.

Thurman Killman, Gen. Supt., Texas Steel Co., Hemphill St., Ft. Worth.

Charles R. McGrail, Pres., Texaloy Foundry Co., 1407 Hoefgen Ave., San Antonio.

Directors—Terms Expire 1952

Chas. Sibbitt, Owner, Refinery Castings Co., P.O. Box 5085, Dallas 2.

C. Eugene Silver, Wks. Mgr., Texas Elec. Steel Cstgs. Co., Box 1418, Houston.

Gerald E. Smith, Vice-Pres., East Texas Electric Steel Co., Inc., P.O. Box 2469, Longview, Texas.

Henry W. Creeger, Jr., Field Engr., Electro Refr. & Alloys Corp. (Mail: 3014 Ferndale St., Houston 6)

Directors—Terms Expire 1953

C. L. Boone, Inspection Dept., Texas Steel Co., 3901 Hemphill St., Ft. Worth.

George B. McLanahan, Supt., American Brake Shoe Co. (Mail: 2014 King St., Houston 10)

Israel Smith, Pres., Western Foundry Co., Tyler, Texas.

L. O. Sturkie, Vice-Pres. & Gen. Mgr., Quality Electric Steel Castings, Inc., P.O. Box 9317, Houston 11.

TIMBERLINE CHAPTER

Chairman—John W. Horner, Jr., Vice-Pres., Slack-Horner Brass Co. (Mail: 3201 W. 29th St., Denver 11)

Vice-Chairman—C. C. Drake, Plant Supt., Griffin Wheel Co. (Mail: 2061 S. Clarkson St., Denver)

Secretary—James E. Schmuck, Met., Rotary Steel Casting Co., 1425—5th St., Denver 4.

(Continued on Next Page)

TIMBERLINE CHAPTER (CONTINUED)

Treasurer—Thomas W. Widener, Sales Repr., American Manganese Steel Div., Amer. Brake Shoe Co. (Mail: 1821 W. Chaffee Place, Denver)

Directors—Terms Expire 1951

W. E. Norris, Acting Wks. Mgr., American Manganese Steel Div., American Brake Shoe Co., 4th & Wazee Sts., Denver.

A. H. Patten, Patten Engineering Co., 1732 Blake St., Denver 4.

Arthur L. Schneider, Owner, Western Bronze & Brass Foundry, 1322 Blake St., Denver 4.

Telfer E. Norman, Climax Molybdenum Co., Midland Savings Bank Bldg., Denver.

Directors—Terms Expire 1952

Ralph B. Akins, Gen. Mgr., Foundry Division, Electron Corp., Denver.

George Traut, Donald Pattern Works, 1218 - 11th St., Denver.

Darrel C. Durant, Asst. Supt., U.S. Foundries, Inc., 1145 Quivas St., Denver 4.

Directors—Terms Expire 1953

Jack Akers, C. S. Card Iron Works, 2501 W. 16th Ave., Denver.

Jerry Lahr, Owner, Aluminum Co. of Denver, 1101 Champa St., Denver 4.

Leon Plamondon, Partner, Atlas Pattern Works, 2763 Blake St., Denver 30.

Warren C. Prosser, Dist. Mgr., Federated Metals Div., American Smelting & Refining Co. (Mail: 1615 Albion St., Denver 7)

TOLEDO CHAPTER

Chairman—Frank W. Beierla, Pres., Clinton Pattern Works (Mail: 1215 Marmion Ave., Toledo 7, Ohio)

Vice-Chairman—John A. Mescher, Unitcast Corp. (Mail: 1604 Potomac Drive, Toledo)

Secretary-Treasurer—R. C. Van Hellen, Prod. Mgr., Unitcast Corporation, 1414 E. Broadway, Toledo, Ohio.

Directors—Terms Expire 1951

John G. Blake, Supt., Alloys Founders, Inc., 1102 Girard St., Toledo 5, Ohio.

Gladwell W. Davison, Fmn., National Supply Co., 3320 Bishop St., Toledo 1, Ohio.

Gerald Rusk, Pres., Freeman Supply Co., 1152 Broadway, Toledo, Ohio.

Directors—Terms Expire 1952

John Cauffiel, Owner, St. Clair Bronze & Aluminum Co., 19 St. Clair St., Toledo 4, Ohio.

Fred P. Murschel, Asst. to Pres., Farrell Cheek Steel Co. (Mail: 714 Polk St., Sandusky, Ohio)

E. E. Thompson, Unitcast Corp., 1414 E. Broadway, Toledo, Ohio.

Directors—Terms Expire 1953

Harry C. Schwab, Chief Met., Bunting Brass & Bronze Co. (Mail: 3547 Mapleway Drive, Toledo 9, Ohio.)

Wayne W. Camp, Slsmn. Freeman Supply Co. (Mail: 833 Lincoln Ave., Toledo 5, Ohio)

Charles E. Eggenschwiler, Asst. Chief Met., Bunting Brass & Bronze Co., 715 Spenser St., Toledo, Ohio.

TRI-STATE CHAPTER

Chairman—Fred E. Fogg, Sales Engr., Acme Foundry & Machine Co., Coffeyville, Kansas.

Vice-Chairman—D. A. Mitchell, Slsmn., Progressive Brass Mfg. Co., 1702 E. 6th, Tulsa 4, Okla.

Secretary—C. C. Beagle, Fdy. Supt., The Webb Corp., Box 519, Webb City, Mo.

Treasurer—Jackson A. Dean, Mgr., Nelson Electric Mfg. Co., 217 N. Detroit, Tulsa 1, Okla.

Directors—Terms Expire 1951

David William Harris, Gray Iron Fdy. Supt., F. Wheatley Pump & Valve Mfg. Co. (Mail: 2721 Easton W., Tulsa, Okla.)

C. A. McNamara, Jr., Secy.-Treas., Big Four Foundry Co., 621 E. Cameron, Tulsa, Okla.

J. E. Winger, Secy.-Treas., Tulsa Iron Works Co., P.O. Box 1165, Tulsa, Okla.

Directors—Terms Expire 1952

Jack M. Foster, Slsmn., Leland Equipment Co., 408 N. Main St., P. O. Box 950, Tulsa.

E. L. Merritt, Owner, Enid Foundry & Machine Co., Box 1643, Enid, Okla.

Directors—Terms Expire 1953

P. D. Coman, Owner, Coman Pattern Works, Box 3065, Tulsa, Okla.

D. W. McArthur, Gen. Fdy. Fmn., Oklahoma Steel Castings Inc., 1200 N. Peoria, Tulsa, Okla.

TWIN CITY CHAPTER

Chairman—S. L. Cameron, Jr., Vice-Pres., Valley Iron Works, Inc. (Mail: Route No. 6, St. Paul 9, Minn.)

Vice-Chairman—C. F. Quest, Vice-Pres., J. F. Quest Foundry Co., 900 S. 4th St., Minneapolis 15.

Secretary-Treasurer—Miss Lillian K. Polzin, Dir. Manufacturers Secretariat, Minneapolis Chamber of Commerce, 1750 Hennepin at Groveland Terrace, Minneapolis 3.

Directors—Terms Expire 1951

Franklin A. Austin, Vice-Pres., Crown Iron Works Co., 1229 Tyler St. N.E., Minneapolis 13.

Joseph W. Costello, Ptrn. Shop Fmn., American Hoist & Derrick Co. (Mail: 1319 W. Idaho Ave., St. Paul 4, Minn.)

Charles F. Kausel, Secy.-Treas., Kausel Foundry Co. (Mail: 2555 Ulysses St. N.E., Minneapolis 13)

Carl W. Olson, Jr., Fdy. Mgr., C. W. Olson Mfg. Co., 1300 Quincy St. N.E., Minneapolis 13.

Directors—Terms Expire 1952

Herbert H. Blosjo, Met., Mpls. Elec. Stl. Castgs. Co., (Mail: 4100 Golden Valley Road, Minneapolis 11.)

John Roth, Vice-Pres., Progress Pattn. & Fdy. Co. (Mail: 1457 Marshall Ave., St. Paul, Minn.)

Harry Blumenthal, Dist. Repr., R. Lavin & Sons, Inc., 334 N. 1st St., Minneapolis.

Directors—Terms Expire 1953

Arthur W. Johnson, Fmn., Northern Malleable Iron Co., 867 Forest St., St. Paul 6, Minn.

Nathan Levinsohn, Fdy. Met., Minneapolis-Moline Co. (Mail: 1906 Summit Ave., St. Paul 5, Minn.)

O. Jay Myers, Dir. of Fdy. Rsch., Werner G. Smith Div., Archer-Daniels-Midland Co., P.O. Box 839, Minneapolis 2.

WASHINGTON CHAPTER

Chairman—Stanley H. Marshall, Met., Atlas Foundry & Machine Co. (Mail: 6101 Regents Park Blvd. Ext., Tacoma 9, Wash.)

Vice-Chairman—James D. Tracy, Treas., Salmon Bay Foundry (Mail: 6023 Sycamore St., Seattle 7)

Secretary—Fred R. Young, Sales Engr., E. A. Wilcox Co., 13631—1st St. S.W., Seattle.

Treasurer—R. N. Tompkins, Mgr., Western Foundry Sand Co., 1039 Elliott Ave., West Seattle, Wash.

Directors—Terms Expire 1951

Samuel Fick, Supt., Fick Foundry, 1005 E. "D" St., Tacoma 2, Wash.

Edward J. McAfee, Master Patternmaker, Puget Sound Naval Shipyard (Mail: Route 2, Box 696, Bremerton, Wash.)

Barton N. Sather, Owner, Sather Foundry Co., 3330 McDougall Ave., Everett, Wash.

Directors—Terms Expire 1952

J. V. Reardon, Slsmn., Federated Metals Div., American Smelting & Refining Co., 101 Dakota St., Seattle.

Alvin T. Zandt, Owner, Zandt Brass Fdy., 2727 - 7th Ave. S., Seattle 4.

Gilbert S. Schaller, Prof. of Mech. Engrg., University of Washington, Seattle 5.

Directors—Terms Expire 1953

J. F. Dolansky, Supt., Griffin Wheel Co., South Tacoma, Wash.

Wm. L. Mackey, Vice-Pres., Washington Stove Works, P.O. Box 919, Everett, Wash.

R. G. Wagner, Puget Sound Naval Shipyard, S-140 Scott St., Spokane, Wash.

James N. Weseell, Puget Sound Naval Shipyard, (Mail: 2322 - 7th, Bremerton, Wash.)

WESTERN MICHIGAN CHAPTER

Chairman—Stanley H. Davis, Sand Res. & X-Ray, Campbell, Wyant & Cannon Fdy. Co. (Mail: 1060 Ada Ave., Muskegon, Mich.)

Vice-Chairman—Ross P. Shaffer, Metallographer, Lakey Foundry & Machine Co., 1st & Water Sts., Muskegon, Mich.

Secretary—Lauren D. Ramsey, Paul M. Wiener Foundry Co., Box 216, Muskegon, Mich.

Assistant Secretary—Fred J. De Hudy, Met., Centrifugal Foundry Co., Sherman Blvd., Muskegon Heights, Mich.

Treasurer—William J. Cannon, Secy.-Treas., The Nugent Sand Co., Box 506, Muskegon, Mich.

Directors—Terms Expire 1951

Roy H. Herbst, Supt., West Mich. Steel Fdy. Co. (Mail: 1420 Clinton St., Muskegon, Mich.)

C. H. Lloyd, Engr., E. F. Houghton & Co. (Mail: 905 Chippewa Drive S.E., Grand Rapids, Mich.)

Wm. R. Tuthill, Supt., Iron Div., American Seating Co., 901 Broadway Ave. N.W., Grand Rapids 2, Mich.

Charles N. Jacobson, Prod. Mgr., Dake Engine Co., 633 Monroe St., Grand Haven, Mich.

Directors—Terms Expire 1952

W. A. Hallberg, Fdy. Engr., Lakey Fdy. & Mach. Co. (Mail: 1515 Apple Ave., Muskegon, Mich.)

Wm. T. Holt, Pres., Enterprise Brass Works, McCracken Ave., Muskegon, Mich.

Kenneth C. McCready, Met., Muskegon Piston Ring Co., Sparta, Mich.

Directors—Terms Expire 1953

Roger W. Hathaway, Wks. Mgr., Cadillac Malleable Iron Co. (Mail: 311 E. Harris St., Cadillac, Mich.)

H. J. Mackay, Owner & Gen. Mgr., Mackay Industrial Sales Co., 706 Jefferson S.E., Grand Rapids, Mich.

Gerrit Witt, Partner, Holland Pattern Co. (Mail: 271 Merril Ave., Muskegon, Mich.)

WESTERN NEW YORK CHAPTER

Chairman—Alfred A. Diebold, Wks. Mgr., Atlas Steel Casting Co., 1963 Elmwood Ave., Buffalo 7.

Vice-Chairman—Erwin Deutschlander, Asst. Fdy. Supt., Worthington Pump & Mach. Corp. (Mail: 5164 Transit Road, Depew, N.Y.)

Secretary—Roger E. Walsh, Sales Rep., Hickman, Williams & Co. (Mail: 32 Eastwood Place, Buffalo 8)

Treasurer—Martin W. Pohlman, Vice-Pres., Pohlman Foundry Co. Inc., 205 Baitz Ave., Buffalo 6.

Directors—Terms Expire 1951

Walter D. Hunsicker, Fdy. Supt., Worthington Pump & Mach. Corp. (Mail: 165 Highland, Williamsville 21, N.Y.)

George A. Knowles, Owner, Geo. A. Knowles Fdy. Inc., Niagara Falls, N.Y.

Directors—Terms Expire 1951 (Cont'd)

Henry F. Sproull, Dist. Repr., A. P. Green Fire Brick Co., 170 Franklin St., Crosby Bldg., Buffalo 2.

John R. Wark, Pres., Wark Foundry Services, Inc., Kenmore 23, N.Y.

Directors—Terms Expire 1952

Robert Bruce, Asst. Fdy. Supt., Blaw-Knox Co. (Mail: 80 Allandale Road, Buffalo)

A. J. Heysel, Branch Mgr., E. J. Woodison Co., 146 Chandler St., Buffalo 7.

Robert D. Young, Purch. Agt., Lumen Bearing Co., 197 Lathrop St., Buffalo 12.

Directors—Terms Expire 1953

Joseph M. Clifford, Supt., Bison Castings, Inc., 575 Howard St., Buffalo 6.

W. H. Oliver, Gen. Supt., Amer. Radiator & Standard Sanitary Corp., 87 Rano St., Buffalo 7.

Joseph H. Sander, Pres., Tonawanda Electric Steel Casting Co., North Tonawanda, N.Y.

WISCONSIN CHAPTER

President—Walter W. Edens, Tech. Dir., Badger Brass & Aluminum Fdy. Co., 5120 W. State St., Milwaukee 8.

Vice-President—George E. Tisdale, Secy.-Treas., Zenith Foundry Co., 1501 S. 83rd St., Milwaukee 14.

Secretary—Joe G. Risney, Owner, Risney Foundry Equip. Co., 1307 N. 63rd St., Milwaukee.

Treasurer—Leon H. Decker, Supt., Planning & Timestudy, Allis-Chalmers Mfg. Co., 1126 S. 70th St., West Allis 14, Wis.

Directors—Terms Expire 1951

Charles Fuerst, Asst. Supt., Falk Corp., Milwaukee.

J. V. Olle, Met., Motor Castings Co., 1323 S. 65th St., West Allis, Wis.

Robert C. Woodward, Chief Met., Bucyrus Erie Co., South Milwaukee, Wis.

Directors—Terms Expire 1952

Kenneth Geist, Tech. Eng. in Chge. Precision Casting Sec. Allis-Chalmers (Mail: Box 87 D, R.R. No. 1, Hales Corners, Wis.)

J. B. Gutenkunst, Secy.-Treas., Milwaukee Mall. & Gray Iron Works, 2773 S. 29th St., Milwaukee 8.

Frank McLean Jacobs, Sales Mgr. & Asst. to Pres., Standard Brass Works (Mail: 1704 N. 71st St., Wauwatosa 13, Wis.)

Directors—Terms Expire 1953

E. C. Meagher, Dist. Repr., Federal Foundry Supply Co., 424 E. Wells St., Milwaukee.

Michael C. Frankard, Prod. Supt., Purchasing Pattern & Castings, Delta Mfg. Co., 600 Vienna St., Milwaukee 1.

H. A. Ziebell, Process Engr., Crucible Steel Castings Co., 2850 S. 20th St., Milwaukee.

Photographed at a recent meeting of the A.F.S. Central New York Chapter were these chapter officers and directors. Left to right: Director Harold Boardman, General Electric Co.; Vice-Chairman William Dunn, Oberdorfer Foundries, Inc.; Director J. F. Livingston, Crouse-Hinds Co.; Director J. O. Ochsner, Crouse-Hinds Co.; Treasurer Francis Dobbs, New York Air Brake Company; Chairman David Dudgeon, Jr., Utica Radiator Corp.; Director George Hochgesang, Straight Line Foundry Co.; and Chapter Publicity Chairman John A. Feola of Crouse-Hinds Company, Syracuse.

NATIONAL DIRECTORS MEET

(Continued from Page 23)

lantic City as the site for the 1952 International and the secretary-treasurer was directed to notify exhibitors and society members accordingly.

It was pointed out that this selection had been discussed with exhibitor groups on two occasions and had been considered by the Board over a period of more than two years. A.F.S. has not held its Convention in Atlantic City since 1915 although many large conventions and exhibits have been staged there in the intervening years by other organizations. Past President Horlebein stated that his recommendation was based on a complete analysis of all available facilities for a convention and exhibit of the extent anticipated for the first full scale International held in the United States since 1926.

3. CHAPTER OFFICERS CONFERENCE. Proposal to hold the 8th Annual Chapter Officers Conference in June 1951 was endorsed and it was stressed that both the chairman and the program chairman of each regular chapter should again be invited to participate at Society expense. Directors who attended the 1950 Conference reported enthusiastically on the reaction of delegates to the discussions on chapter affairs.

4. SOCIETY-SPONSORED RESEARCH. Continuance of seven research projects—under the Gray Iron, the Brass and Bronze, the Malleable, the Steel, the Aluminum and Magnesium, and the Sand Divisions, and the Heat Transfer Committee—was affirmed. At the same time a Board committee was authorized to review annually with the chairman of each division research committee and the A.F.S. technical director, the scope and progress of each project with a view to familiarizing the Board with the research work being done under A.F.S. Centrifugal casting research at the Canadian Bureau of Mines, in which A.F.S. cooperates, is continuing.

5. SAFETY AND HYGIENE AND AIR POLLUTION. The Directors authorized formation of a Board committee to develop all phases of a new Safety and Hygiene and Air Pollution Project as previously approved in January 1949. This committee will prepare a plan for presentation at the Board meeting of September 30-October 1, for immediate prosecution of the project.

6. CONVENTION REGISTRATION FEES. Reviewing registration fees charged at the St. Louis and the Cleveland Conventions, the Board approved charging $2.00 for A.F.S. members, $5.00 for non-members, at the non-exhibit Convention to be held April 23-26, 1951, in Buffalo. It was stated that registration fees charged in non-exhibit years are intended only to reimburse the Society for the very considerable expense involved and would not add in any way to Society reserves.

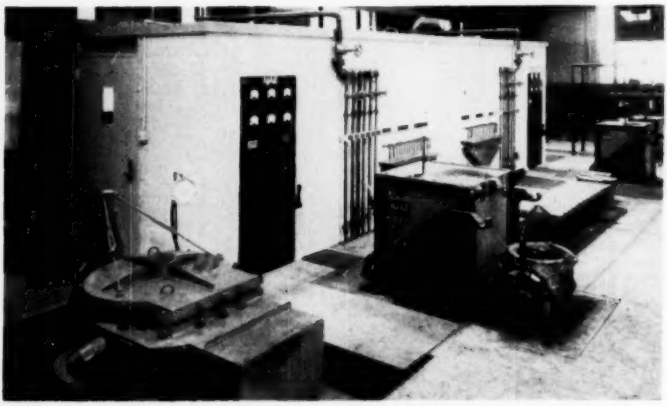
At the suggestion of one of the directors the Staff was authorized to publicize strongly the fact that both members and non-members were welcome to attend the Annual Business Meeting of the Society held during the Convention without paying a registration fee.

Technical Director S. C. Massari reported on progress in Cupola Research and pointed out that the death of Committee Chairman R. G. McElwee called for a complete revision of committee plans and procedures. Accordingly, President Woody was authorized to expand the Cupola Research Committee to review progress to date. The enlarged committee is expected to recommend at the September meeting of the Board a plan for carrying on this important activity of A.F.S.

President Woody announced that A.F.S. representatives on the National Castings Council would be Past President Horlebein, recently elected president of NCC, and himself.

The A.F.S. president was authorized to appoint the following standing and special committees as provided under the By-Laws: Technical Correlation, National Membership, Chapter Contacts, Annual Lecture, By-Laws, Publications, and International Relations. He announced that in addition to himself as chairman, the Finance Committee would consist of Vice-President Seelbach and Past President Horlebein. He said he was not appointing an Auditing Committee because its functions had been assumed by the Finance Committee.

Bureau Of Standards Installs New Foundry Equipment



Recently-installed new equipment at the National Bureau of Standards foundry, Washington, D. C., includes, left to right: 100-lb vacuum furnace; 650-lb tilting furnace; 300-lb tilting furnace and 200-lb lift coil furnace. Fireproof enclosure in background contains two sets of capacitors. These, plus two new 250 kw generators, permit simultaneous, independent operation of two furnaces. Monorail system for molding room is planned.

K. L. Sanders

Kenneth L. Sanders, author of *"Dies for a Malleable Production Foundry,"* Page 24, is tool and die engineer for the Albion Malleable Iron Co., Albion, Mich., where he began his foundry career as a timekeeper in 1918 at the age of 13 . . . He later served his apprenticeship in Albion Malleable's Pattern Department, working there as a patternmaker until 1933, when he was appointed to his present position . . . He has been a member of the American Foundrymen's Society since 1948.

A. J. Howarth

Alfred J. Howarth, author of *"Develop Gating Formulas for Aluminum Alloy Castings,"* Page 32, is sales engineer for Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J.... Mr. Howarth completed his apprenticeship with Browne & Sharpe, Providence, R. I., in 1916, before joining the Navy in World War I . . . Since that time he has been a molder, foreman, superintendent, engineer, consultant and sales engineer in foundries in Rhode Island, Massachusetts and New Jersey . . . Mr. Howarth spoke on gating and risering at the A.F.S. Regional Conference held last October in Hoboken, N. J., and has given lectures on gating, sand control and other phases of foundry work while with an engineering firm.

A. I. Krynitsky

Born and educated in Russia under the Czarist regime, A. I. Krynitsky, author of *"Silica Sands—Sieve Analyses,"* Page 40, first studied metallurgy at the Michael Artillery College & Academy under a noted Russian authority, Prof. D. K. Techernoff . . . From 1907 to 1915, Mr. Krynitsky was superintendent of the Metallurgical Department of the Russian Government's time-fuse plant and from 1915 to 1918 was chief inspector of time fuses ordered by the Imperial Russian Government from the United States. He was in this country at the time of the Russian Revolution and remained here as a member of the metallurgical staff of the National Bureau of Standards, Washington, D. C., where he is today Chief of the Experimental Foundry . . . He is a member of the Executive Committee of the A.F.S. Sand Division and of its Grading and Fineness and Sand Book Revision Committees.

F. E. Sutherland

Author of *"Metallurgy of Iron Base Rolls,"* Page 46, Frank E. Sutherland is technical assistant to the foundry superintendent of Dominion Engineering Works, Montreal, a position he has held since leaving McGill University in 1948 . . . A veteran of World War II, Mr. Sutherland served as a Sergeant in the Royal Canadian Corps of Engineers for five years.

Roy W. Schroeder, who analyzes molding and patternmaking entries in *"Increased Activity Marks 1950 A.F.S. Apprentice Contest,"* Page 28, is assistant professor of Foundry and Pattern Design, University of Illinois, Navy Pier Branch, Chicago, and is chairman of the A.F.S. Apprentice Contest Committee . . . Possessor of an extensive background both in the foundry industry and in foundry education, Mr. Schroeder has for many years been active in A.F.S. technical and educational activities. In addition to authoring an analysis of A.F.S. Apprentice Contest entries in AMERICAN FOUNDRYMAN each year for the past several years, Mr. Schroeder has written for the trade and technical press extensively . . . He is a member of the American Society of College Professors and the Society for the Promotion of Engineering Education and several technical societies and is chairman of the Educational Committee of the Chicago Chapter of the American Foundrymen's Society.

Report Correct Title

THE WHO'S WHO page of the June issue of AMERICAN FOUNDRYMAN incorrectly reported that R. H. Olmsted, author of *"Core Oil Evaluation Method"* published in that issue, was sand control supervisor at Lake City Malleable, Inc. Since early 1949 he has been service engineer with Whitehead Brothers Co., New York, with headquarters in Conneaut, Ohio.

Italian Association Of Metallurgy To Hold Fourth Convention

FOURTH NATIONAL CONVENTION of the Italian Association of Metallurgy will be held at the Old Palace in Florence September 28 through October 1. Themes of the convention are pure metals and metallurgical-mechanical aspects of removal of waste. First two days will be devoted to presentation of papers, the third to discussion, with October 1 being available for plant visitations.

A feature of the convention will be the first presentation of the Luigi Losana gold medal honoring the memory of Losana, a professor in the Polytechnical Institute of Turin and director of the central laboratory of research and control of Fiat.

Other convention features include exhibits of artistic castings and antique metallurgy, presentation of Italian metallurgy prizes, and special excursions.

Credit Where Due

PROF. NOBUAKI OGURA, professor of mechanics, Tokushima University, Japan, provided the A.F.S. Library with its latest foreign language acquisition, *A Consideration of the Recent Progress of Iron and Steel in Japan* by Keizo Iwase. Credit to Prof. Ogura was inadvertently omitted in announcing the book in the July issue of AMERICAN FOUNDRYMAN.

Revise ASTM Foundry Standards

RECENT ACTIONS of American Society for Testing Materials committees of direct interest to users and producers of castings include the preparation of a new tentative standard and the revision of seven tentatives in use from one to six years. New tentative is A217-49T entitled Alloy Steel Castings for Pressure-Containing Parts Suitable for High Temperature Service, a consolidation of A217 and A157.

Revised ferrous tentative standards are: Foundry Pig Iron, A43-45T; Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650 F, A278-44T; Corrosion-Resistant Iron-Chromium and Iron-Chromium-Nickel Alloy Casts for General Application, A296-49T; and Heat Resistant Iron-Chromium and Iron-Chromium-Nickel Alloy Castings for General Application, A297-49T.

Non-ferrous tentative standards revised include: Magnesium-Base Alloys in Ingot Form for Sand Castings, Die Castings, and Permanent Mold Castings, B93-49T; Magnesium-Base Alloy Die Castings, B94-48T; and Magnesium-Base Alloy Permanent Mold Castings, B199-47T.

FOUNDRY Personalities

Otto Seyferth, owner of the West Michigan Foundry Co., Muskegon, Mich., was recently elected president of the Chamber of Commerce of the United States. Since 1940 a member of the Board of Directors of the Chamber of Commerce, he has been chairman of that organization's Committee on Labor Relations. Mr. Seyferth's varied career has included work as an apprentice stonecarver, apprentice machinist's helper, machinist, union official and organizer, timekeeper, production manager, investment banker, business reorganizer and foundryman. Mr. Seyferth purchased a half interest in West Michigan Foundry Co., becoming sole owner in 1932. In addition to running this 500-employee, 1,000-ton per month foundry, he is president of the Austin Trailer Equipment Co. and the Austin Machinery Co., is a director of a number of corporations and a trustee of Ripon College.

Otto Seyferth

Harlow F. St. Pierre, formerly assistant sales manager, has been appointed to the newly-created position of manager of Industrial Casting Sales Division of Hunt-Spiller Mfg. Corp., Boston.

Jack C. Schubert, who joined the United States Graphite Co., Saginaw, Mich., last January following graduation from Michigan State College, has been named Graphitar engineer. Mr. Schubert will work with sales engineers on development of this carbon-graphite product at the company's home offices in Saginaw.

Donald J. Reese, head of the Development & Research Division of the International Nickel Co., New York, has been appointed visiting lecturer for the Massachusetts Institute of Technology, covering cast iron and cupola operation. For many years active in A.F.S. technical committee work, Mr. Reese formerly headed the A.F.S. Cupola Research Committee.

T. S. Roderick, formerly a Lieutenant Commander in the Navy, has been named general manager of Non-Ferrous Permanent Mold, Inc., Mansfield, Ohio. A 1941 graduate of the United States Naval Academy, Commander Roderick served as engineering officer, gunnery officer and executive officer on heavy Naval vessels, saw three years' duty as a submarine commander, commanded a wartime submarine school at Pearl Harbor, handled all Naval transport operations in China and participated in the atom bomb tests in Bikini. With Non-Ferrous Permanent Mold, Inc., he will concern himself mainly with sales and operations.

T. S. Roderick

A. E. St. John, formerly with Federated Metals Div., American Smelting & Refining Co., for 25 years has been named a member of the sales and engineering staff of Barth Smelting Corp., Newark, N. J. A graduate in metallurgical engineering from the Case Institute of Technology, Mr. St. John is the author of several papers on non-ferrous alloys.

Donald Dingwall, castings manufacturers' representative in the Chicago area, has been named sales agent for Wellman Bronze & Aluminum Co.'s complete line of magnesium, aluminum and bronze permanent mold and sand castings. A graduate of Northwestern University, Mr. Dingwall served as a Lieutenant Commander in the Navy in World War II and was later instrumental in forming the American Matchplate Co., which he sold in 1948.

R. W. Tompkins, formerly in charge of Midwestern operations for the United States Plywood Corp., has been named general sales manager for the U. S. Reduction Co., Chicago. A graduate of the University of Illinois in chemical engineering, Mr. Tompkins has been with Inland Steel Co., U. S. Gypsum Co., Certain-Teed Products Corp., Lehon Co., and U. S. Plywood Corp. in executive sales capacities.

Fred W. Jacobs

Frederic W. Jacobs has been named chief metallurgist for Texas Foundries, Inc., Lufkin, Texas.

Edgar G. Richardson, foundry superintendent, Delco-Remy Div., General Motors Corp., Anderson, Ind., was recently appointed a director of Central Indiana Chapter of A.F.S.

John D. Altstetter, FEF scholarship student at Ohio State University, recently received second prize in a nationwide contest for his essay on "*Applications for Cast Stainless Steel in the Chemical Industry.*" The contest was sponsored by the Cooper Alloy Foundry Co., Hillside, N. J. Altstetter is taking the Foundry Option in Industrial Engineering at OSU and is a member of the A.F.S. Ohio State University Student Chapter.

F. L. Roewer, for the last 15 years associated with the International Nickel Co., has been named sales manager of Abrasive Alloy Castings Co., Bridgeboro, N. J. Mr. Roewer has been active in the promotion of INCO's Ni-Hard, Ni-Resist and other nickel alloy cast irons for special purposes. Abrasive Alloy Castings Co. specializes in the production and sale of these alloys. Mr. Roewer is a member of A.F.S. and ASTM and is a veteran of World War II.

Albert Portevin, distinguished French metallurgist and teacher, was awarded the British Institute of Metals Medal in platinum for his contribution to the science and practice of non-ferrous metallurgy. Professor Portevin is a member of the faculty of the Ecole Superieure de Soudure Autogene, Paris, technical director of the periodical *"Revue de Metallurgie"* and a member of the board of directors of several metallurgical companies. He has specialized in the physical metallurgy of steels.

Herbert J. Rosen, president of the Griffin Wheel Co., Chicago manufacturers of chilled car wheels, on July 2 completed 50 years of service with the company. Mr. Rosen joined Griffin at Denver, Colo., in 1900 and was later transferred to Chicago. Since that time, he has served in executive capacities in the company's various plants. He was elected a vice-president in 1913, executive vice-president in 1915 and president in 1918. He has been a company director since 1913.

H. J. Rosen

Ernest M. Knapp, treasurer, has been named president, and **Rex J. Myers,** assistant foundry superintendent, has been promoted to vice-president in charge of operations of Ferro Machine & Foundry, Inc., Cleveland. Other appointments are: President **John M. Price,** to be chairman of the Board of Directors; **Donald L. Heine,** chief accountant and comptroller, to be treasurer and assistant secretary; **Henry B. Myers,** vice-president in charge of operations, to retain title as vice-president and serve the company in an advisory and consulting capacity. Mr. Knapp, who is 40, holds degrees from Miami University and Kenyon College and has been with Ferro since 1928. Rex J. Myers, son of Henry B. Myers, has grown up with the business, working with the firm since 1924. Mr. Heine attended Fenn College and Western Reserve University and is a Naval veteran of World War II. He is a certified public accountant.

Fernando Gonzales Vargas, consulting metallurgist and chairman of the A.F.S. Mexico City Chapter visited the A.F.S. National Office in July to pick up copies of the Lynchburg Foundry Co. film, *"Men and Molds,"* and the A.F.S. Research film, *"Fluid Flow in Transparent Molds."*

J. William Schaeffer has been named head of the Standards Section, Production Control Dept., Hunt-Spiller Mfg. Corp., Boston. Mr. Schaeffer, who began as a coremaker's helper with the company in 1936, completed his coremaking apprenticeship, then turned to timestudy and production standards work. During World War II he served with the Navy.

Herbert H. Klein, formerly sales manager, and **Milton A. Meier,** formerly Detroit office manager, have been elected vice-presidents of L. A. Cohn & Bro., Inc., Chicago non-ferrous alloy smelting firm.

Stephen Stroup, sales representative for Peerless Sand Products Co., Conneaut, Ohio, was seriously injured in a recent automobile accident near Erie, Pa. He is convalescing at Homot Hospital, Erie.

William E. Carver has been appointed assistant foundry superintendent for Acme Aluminum Alloys, Inc., Dayton, Ohio.

J. R. Cochran has accepted a position as foundry metallurgist in charge of the Melting Department of Sterling Castings Co., Bluffton, Ind.

OBITUARIES

Jules Mathews, sales representative for Spo, Inc., Cleveland, died July 10.

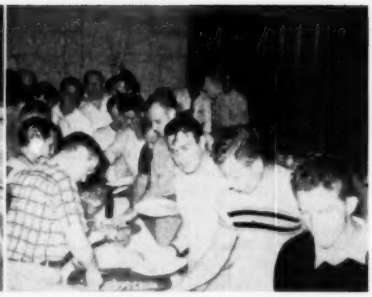
Tom Bellsnyder, 65, president and founder of the Jefferson Foundry Co., Birmingham, Ala., died June 16 at his Shades Mountain country home, outside Birmingham, after a prolonged illness. A native of Birmingham, Mr. Bellsnyder began his foundry career with the now defunct Birmingham Machine & Foundry Co. in 1897. He later worked for the Dimick Pipe Workers before founding his own firm.

Tom Bellsnyder

Long active in the Birmingham Chapter, Mr. Bellsnyder served on its Board of Directors. He was active in the Boy Scouts of America and the Shriners and was well-known for his civic activities.

Two Canadian Foundrymen Awarded 50-Year A.F.S. Pins

Awarded A.F.S. pins in a recent ceremony in recognition of a half-century of service to the foundry industry were Molder Walter Scott and Pattern Shop Foreman George Carruthers of John Bertram & Sons Co., Ltd., Dundas, Ont., Canada. Left to right: Mr. Scott, Foundry Superintendent S. E. Robinson, Mr. Carruthers and H. G. Bertram, president of John Bertram & Sons Co., Ltd.



Chow time at Central Michigan Chapter's Annual Outing, June 24, found plenty of hearty appetites after a day of sports and activities. (Center) Horseshoe Champs Toussaint and Labun, Albion Malleable.

CHAPTER ACTIVITIES NEWS

Central New York

John A. Feola
Crouse-Hinds Co.
Publicity Chairman

ANNUAL JUNE OUTING of the Chapter, held Friday, June 16, at Hinerwadel's Grove, Syracuse, was enjoyed by 175 members and guests, who participated in an afternoon and evening of social activities, including a real old-fashioned clambake with "all the trimmin's."

The outing closed the Chapter's activities for the 1949-50 season and was attended by several members of the A.F.S. Western New York Chapter.

Retiring Chapter Chairman John F. Livingston, Crouse-Hinds Co., and officers and directors of the Chapter wish to thank those companies sponsoring the outing—S. Cheney & Son, Crouse-Hinds Co., Oberdorfer Foundries, Inc., Caldwell & Ward Brass Co., Syracuse Foundry, Inc., Stanton Foundry, Inc., Straight Line Foundry & Machine Corp., Syracuse Chilled Plow Co., Inc., Meloon Bronze Foundry, Inc., and Fay Foundry Corp.

Eastern New York

George Danner
American Locomotive Co.
Publicity Chairman

ANNUAL MEETING, held June 20 at Circle Inn, Lathams, featured as its speaker Howard W. Davenport of the New York Bell Telephone Co.'s Public Relations Department, who spoke on *"Highways of Speech."*

After dinner, a vocalist provided some easy-to-listen to songs for everyone's enjoyment.

Officers for the ensuing year were then introduced by Chairman Kenneth F. Echard, Eddy Valve Works. Jasper Wheeler of the Wheeler Bros. Foundry, Troy, was elected chairman.

A letter read by the Secretary told of a recent illness of Mr. Wheeler and his wish to resign in order that the chapter have an active chairman. His resignation was accepted and Leo M. Scully, Scully Foundry and Machine Co., Coxsackie, was named chairman. New directors are Scott Mackay, professor at Rensselaer Polytechnic Institute, Troy; R. N. Williams, George F. Pettinos, Inc.; Lee Martin, Northern Indiana Brass, Glen Falls; and J. E. Waugh, Foundry Division, General Electric Co., Schenectady, program chairman.

The speaker presented interesting magic-like demonstrations of microwave radio relay systems.

Of great interest was his explanation of the toll dialing service, or city-to-city dialing. Mr. Davenport had samples of tubes, thermisters, coaxial cables, relays, etc., which were discussed in detail in a question period following his talk.

Incoming President John Russo, Russo Foundry & Equipment Co., (right) accepts rammer symbolizing Northern California Chapter presidency from Outgoing President James Francis, Vulcan Steel Foundry Co., at the Chapter's Annual Ladies' Night, held on June 17.

Chesapeake

Jack H. Schaum
National Bureau of Standards
Chapter Reporter

FINAL MEETING of the 1949-50 season, held at the Engineers' Club, Baltimore, had as its speaker Max Kuniansky of the Lynchburg Foundry Co., Lynchburg, Va., who brought with him Lynchburg's sound film, *"Men and Molds."* The film shows the growth and improvement of machinery for making molds and cores.

The members then divided into two groups for round table discussions on ferrous and non-ferrous foundry practices. The cast iron section was presid-

ed over by Mr. Kuniansky and most of the discussion centered around nodular iron. Emphasis was placed on the need for a foundry metallurgist capable of coping with and controlling the many problems that arise in the production of this material. Defective castings are the result of improper gating and risering and impurities in the iron, it was pointed out.

The non-ferrous round table was conducted by David Tamor, American Chain & Cable Co. The advantages of generous filleting were discussed, along with the merits of coke, oil and gas fuels, the dangers of water vapor present in new furnace patches and ladle linings, and the causes of inverse segregation on lead-tin bronzes.

Central Illinois

John R. Nieman
Caterpillar Tractor Co.
Chapter Reporter

FOURTH ANNUAL CLAMBAKE was held Saturday, June 16, at the 40 and 8 Chateau near East Peoria, Ill. Music and entertainment in the afternoon preceded the evening's festivities, which opened with a dinner of clam juice, shrimp, baked clams, chicken, etc.

Quad City

R. E. Miller
John Deere Planter Works
Publicity Chairman

JUNE 17 was a great day for local foundrymen. The chapter held its Annual Outing, a good old fashioned one, at Camp Noble on Rock River. About 200 relaxing members talked shop in a cool and refreshing atmosphere, with cool and refreshing drinks.

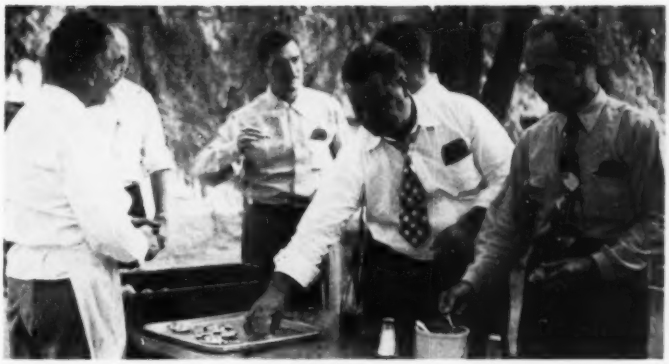
A golf tournament in the morning was followed by games as the day progressed. Each attending member was asked to guess the weight of a casting display. Guessing varied as much as 100 lb on a 45-lb total. A generous chicken dinner put members in the mood for entertainment that followed.

Central Michigan

J. T. Ehman
Albion Malleable Iron Co.
Publicity Chairman

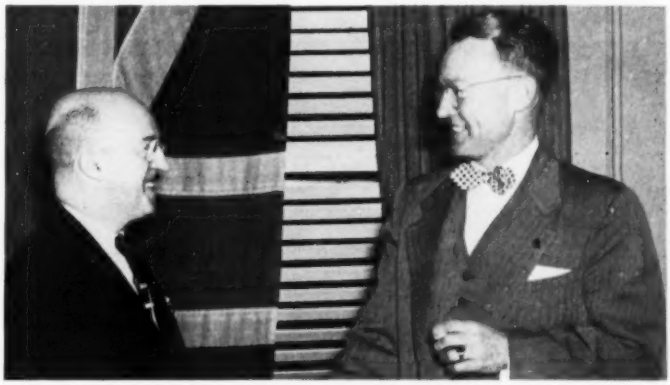
APPROXIMATELY 200 members and guests of the Central Michigan Chapter attended the annual outing at the Cascades Country Club, Jackson, on Saturday, June 24. The outing committee, under Chairman George Petredean, Calhoun Foundry, arranged a full day of entertainment, consisting of sports, beverages, luncheon, dinner and concluded by a floor show in the evening.

Prizes were awarded the winners in various sporting events. The softball team organized by Louis Heisler, Gale Manufacturing Co., took honors in



Oysters on the half-shell were a featured attraction at Eastern New York Chapter's Annual Outing, held at Hinerwadel's Grove, near Syracuse.

Looked pleased at the results of their efforts to make Northern California Chapter's Annual Ladies' Night, June 17, a success are, left to right: Edwin Brumley, Brumley-Donaldson Co.; Edward Rowe, Balfour-Guthrie Co.; Peter Valentine, Jr., Del Monte Properties Co.; and Entertainment Chairman Jay Snyder, Jos. Musto Sons-Keenan Co. Abrasive Div.



Lucien Guilmette, Canadian Foundry Supplies & Equipment, Ltd., Montreal, incoming chairman of the Eastern Canada Chapter (left), receives congratulations of Eastern Canada's Outgoing Chapter Chairman James H. Newman of Newman Foundry Supply, Ltd., Montreal, at a recent meeting.

Part of the crowd of 175 foundrymen and their guests attending the Central New York Chapter's Annual Outing, held at Hinerwadel's Grove, June 17, hungrily anticipate a delicious clambake with "all the trimmin's."

Photographed at the May 26 meeting of the Tennessee Chapter were, left to right: Retiring Chapter Chairman Karl Landgrebe, The Wheland Co. Speaker of the evening E. C. Jeter, Ford Motor Co., Dearborn, Mich., and Incoming Chairman Paul Arnold, United States Pipe and Foundry Co.

this event: Dale Brott, Simpson & Co., Donald Gaertner and Joseph Sampson, Albion Malleable Iron Co., were awarded prizes in the golfing competition. Other prize winners were Harold Labun and William Toussaint, Albion Malleable, in the doubles horseshoe pitching tournament, while Harold Labun was also top man in the singles tournament. Frank Jasienski of Albion Malleable was winner of the casting weight guessing contest, missing the correct total weight of five castings by one ounce.

Over 150 door prizes were taken home by foundrymen, including a portable radio and many items of sporting equipment. Sandwiches were served at noon, and a smorgasbord was featured in the evening.

Assisting Chairman Petredean on the General Arrangements Committee were Chapter Chairman Fitz Coghlin, Albion Malleable, Chairman-Elect Jack Secor, of Hill and Griffith, David Sherman, Engineering Castings Co. and 33 other members.

Northern California

J. M. Snyder
Jos. Musto Sons-Keenan Co.
Chapter Reporter

MOST SUCCESSFUL "Ladies' Night" ever held by the Chapter took place at the Orinda Country Club June 16. Over 150 foundrymen and guests and their wives enjoyed a supper dance and professional entertainment, including an act by two television performers from San Francisco.

James Francis, Vulcan Steel Foundry Co., Oakland, outgoing chapter chairman, turned over the rammer symbolizing chapter leadership to Incoming Chairman John Russo, Russo Foundry Equipment Co., Oakland.

Introductions were then made by A.F.S. Past National Director Samuel

Clams, shrimp, corn-on-the-cob and beer made a hit with hungry foundrymen at Central Illinois Chapter's Annual Clambake, June 10. Left to right: C. W. Russell, Caterpillar Tractor Co.; Robert Spengler and James Smith, Annex Pattern Co.; Dewey Smith and Earl Brown, Caterpillar Tractor Co., and (right photo): W. Alston, A. L. Lamasters, D. Denison and A. Bolton, of Alloy Engineering & Casting Co., Champaign.

Russell, Phoenix Iron Works. Some sort of record was established, in that the foregoing ceremonies were completed in four minutes.

Members of the Committee planning the affair were: Chairman Jay Snyder, Jos. Musto-Keenan Co.; Co-Chairman Edwin Brumley, Brumley-Donaldson Co.; Harry Miller, Ingersoll-Rand Co.; Edward Rowe, Balfour-Guthrie Co.; Roy Hoag, General Metals Corp.; Charles Marshall, Industrial Supply Co.; William Skinner, Pacific Graphite Co.; James Rimmer, Columbia Steel Co.; Ray Jerome, Pacific Grinding Wheel Co.; Daniel Henry, Federated Metals Div., American Smelting & Refining Co.; Martin Verbeet, Atkins-Kroll Co.; John Russo, Russo Foundry Equipment Co.; Matt Morrison, H. L. E. Meyer Co.; and Peter Valentine, Jr., Del Monte Properties.

Mexico City

N. S. Covacevich
La Consolidada, S. A.
Chapter Secretary

RESOLUTIONS adopted by the Mexico City Chapter at a meeting of its Board of Directors on July 5 included:

(1) Publication in inexpensive form of notices concerning the progress of the foundry industry and of data on foundry personnel.

(2) Increase of interest in technical foundry developments by establishing close liaison between A.F.S and Mexican foundry groups, particularly the Iron Industries section of the Mexican Chamber of Transformation Industries. This activity will be undertaken by Luis Zalce of Iturbe y Zalce.

(3) To hold a banquet July 21 in the Majestic Hotel, Mexico City, in honor of Chapter President Fernando Gonzales Vargas. Secretary-Treasurer N. S. Covacevich, and chapter directors.

In order to fulfill these aims, cooperation of all chapter members has been urged. Engineer Juan Latapi Sarre has been asked to prepare the proposed Bulletin, while Isidro Lopez Llorente and Luis Delgado Vega will be in charge of banquet arrangements.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Company
Chapter Reporter

MONTHLY DINNER MEETING of the Chapter was held at the Hotel Patten May 26, and was the last meeting of the summer, with 57 guests and members present.

Karl Landgrebe, The Wheland Co., retiring chairman, asked for the Treasurer's report for the fiscal year. Treasurer Herman Bohr reported $1859.66 on hand in cash and bonds.

Sam Johnson, Chairman of the Ed-

(Continued on Page 92)

Scenes from Wisconsin Chapter's "Old Timers and Apprentices Night," at the Hotel Schroeder, Milwaukee. Top left: Andrew Bottoni, Milwaukee Vocational School, chairman of the chapter's Apprentice Contest Committee, presents awards to winners of chapter's Apprentice Contest. Top right: Seven newcomers to the ranks of the chapter's old timers. Lower left: a group of old timers enjoying their dinner. Lower right: this team of acrobats was part of the lavish entertainment provided. (Photographs courtesy W. F. Napp, Badger Fire Brick & Supply Company).

FUTURE CHAPTER MEETINGS

● ***AUGUST 19***
CANTON DISTRICT
Mayfair Country Club, Greensburg, Ohio
ANNUAL PICNIC

● ***AUGUST 19***
WESTERN MICHIGAN
Pontaluna Golf Club, Muskegon
ANNUAL STAG PICNIC

● ***AUGUST 26***
ONTARIO
Estate of Rolph Barnes, Waterdown, Ont.
ANNUAL PICNIC

● ***SEPTEMBER 8***
WISCONSIN
Schroeder Hotel, Milwaukee
SECTIONAL MEETINGS

● ***SEPTEMBER 13***
MO-KAN
Fairfax Municipal Airport, Kansas City, Mo.
T. E. EAGAN
Cooper-Bessemer Corp.
"Practical Aspects of Nodular Iron"

● ***SEPTEMBER 14***
NORTHEASTERN OHIO
Tudor Arms Hotel, Cleveland
CLYDE A. SANDERS
American Colloid Co.
"Suggestions on Sand and Molding Practice"

● ***SEPTEMBER 15***
NORTHERN CALIFORNIA
T. E. BARLOW
Eastern Clay Products, Inc.
"Foundry Sand"

TEXAS
Texas State Hotel, Houston
STEEL, GRAY IRON AND NON-FERROUS ROUND TABLES.

● ***SEPTEMBER 16***
NORTHWESTERN PENNSYLVANIA
Tieman's Grove and Lake Shore Golf Club, Erie, Pa.
ANNUAL PICNIC AND GOLF TOURNAMENT

ROCHESTER
Barnard's Firemen's Exempt Assn.
ANNUAL PICNIC

MICHIANA
Labor Farm, near Sodus, Mich.
ANNUAL PICNIC

● ***SEPTEMBER 22***
BIRMINGHAM DISTRICT
Queenstown Lake
ANNUAL OUTING

● ***SEPTEMBER 21***
BRITISH COLUMBIA
Pacific Athletic Club, Vancouver
T. E. BARLOW
Eastern Clay Products, Inc.
"Cupola Practice"

Chapter Officers AFS and Directors

Allen J. Reid
General Refractories Co.
Indianapolis
Chairman
Central Indiana Chapter

Alfred A. Diebold
Atlas Steel Casting Co.
Buffalo, N. Y.
Chairman
Western New York Chapter

C. F. Quest
J. F. Quest Foundry Co.
Minneapolis
Vice-Chairman
Twin City Chapter

Stanley H. Davis
Campbell, Wyant & Cannon
Fdy. Co., Muskegon, Mich.
Chairman
Western Michigan Chapter

W. H. Lyne, III
Hughes Tool Co.
Houston, Texas
Chairman
Texas Chapter

C. K. Donoho
American Cast Iron Pipe Co.
Birmingham, Ala.
Vice-Chairman
Birmingham District Chapter

D. S. Yeomans
Geo. F. Pettinos, Inc.
East Orange, N. J.
Chairman
Metropolitan Chapter

E. W. Claar
Eastern Clay Products, Inc.
Jackson, Ohio
Director
Central Ohio Chapter

M. C. Frankhard
Delta Mfg. Co.
Milwaukee
Director
Wisconsin Chapter

W. F. Graden
Simonds Abrasive Co.
Philadelphia
Director
Philadelphia Chapter

E. C. Sooy
Kansas City Hay Press Co.
Kansas City, Mo.
Director
Mo-Kan Chapter

B. A. Genthe
S. Obermayer Co.
Cincinnati
Secretary
Cincinnati District Chapter

RADIOGRAPHY pointed the way to sound production

Radiography revealed a recurring irregularity in a simple production casting—showing the need for a change in casting procedure.

Simple castings are not always soundly made the first try. These were for a customer who had learned to expect highest quality from the foundry.

The first group cast was checked radiographically. Similar irregularities were found in nearly every part, indicating the need for a change in casting procedure. With the help of radiography the change was made with a minimum of lost time, and sound parts were quickly cast and delivered to the customer.

Any foundry that seeks a reputation for producing consistently sound castings will find radiography an invaluable aid. It detects irregularities. It pictures the effects of changes in gating, venting, pouring temperatures, chilling, and other variables. It pays for itself from savings in development time and in reduced rejections—builds customer good will.

Ask your x-ray dealer to explain all the ways radiography can help you increase yield and cut costs, or ask Kodak for a copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N. Y.

Radiography . . .

another important function of photography

Kodak
TRADE-MARK

NEW Foundry Products

Readers interested in obtaining additional information on items described in New Foundry Products should send requests to Reader Service, American Foundryman, 616 S. Michigan, Chicago 5, Ill. Refer to the items by means of the convenient code numbers.

Hydraulic Lift Truck

AG1—Lift-King electric industrial trucks feature two-stage hydraulic lifting by means of ram-within-a-ram principle. Free lift of 66 in. permits truck to tier goods inside freight cars, street trucks, and in low headroom spaces. Model reaches up to 130 in.

from floor, can carry up to 6,000 lb and has overall collapsed height of only 83 in. Second series of models has overall collapsed height of 68 in., free lift of 51 in. and total reach of 100 in. Sit-down operation is coupled with automotive controls. Other features: easy installation of special handling accessories, ball-bearing telescoping fork carriage, hydraulic tilting mechanism, full vision, shockless steering, sealed hydraulic brakes and cushion tires. *Yale & Towne Mfg. Co.*

High Pressure Hydraulic Cylinders

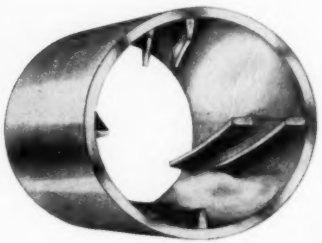
AG2—High pressure hydraulic cylinders that meet recently approved JIC Hydraulic Standards are now available in a complete standard line, from 1½ in. to 12 in. bores with 2000 to 3500 psi operation. The cylinders have solid steel heads, caps, and mountings; have "O" rings for leakproof pressure sealing at cylinder ends; special leather rod seal with friction-free, leakproof operation; dirt wiper seals; hard chrome plated solid steel piston rod; cylinder polished to 15 micro-inch finish. Air bleeds are available to prevent air entrapment; also cushioning at one or both ends on same mounting dimensions as non-cushioned cylinders. *Miller Motor Co.*

Foundry Shakeouts

AG3—New line of foundry shakeouts, exhibited at the 1950 A.F.S. Foundry Congress & Show are available in sizes ranging from Model CA46 with 8,000 lb load capacity to Model CA610 with 30,000 lb load capacity. These full-floating shakeouts (1) permit continuous straightline foundry operation, (2) make possible centralized dust control, (3) speed reduction of sand lumps and temperatures for faster sand recovery, (4) eliminate flask damage, and (5) simplify reclamation of reinforcing rods, gaggers and sprues. *Link-Belt Co.*

Cupola Tuyere

AG4—Double auger tuyere for use in cupolas differs from conventional tuyeres in that internal ribs cause boring action of blast and penetrate farther into stock than would otherwise be possible. Blast penetrates through coke and melting stock,



causing highest temperature in center of cupola, above tuyeres, instead of around circumference. Lining suffers less destruction and heat is available where it is most needed—for melting iron, according to manufacturer. No slag bridge can form, permitting uniform melting rate throughout heat. Because there is no slag bridge and lining suffers little destruction, cupola is easily prepared for the next heat. *Sprow Tuyere Co.*

Sand Mixer

AG5—Sand mixer for core oil sand, dry core compound or facing sand features action which rubs and squeezes sand with regulated pressure, producing fast, thorough mixing with no heating of sand and no crushing of sand grains. Portable, Whirl-mix No. 300 holds 3 cu ft of sand, produces 4,000 lb of mixed and aerated sand per hour. Wear resistant throughout, unit is compact, weighs 1,060 lb, requires no foundation and has discharge door 28 in. of floor—high enough to accommodate wheelbarrow. Model 300 will mix 300 lb of core oil sand in 3 min or 200 lb of facing sand or dry core compound in 1½ min. *Federal Foundry Supply Co.*

Flowable Material Transporter

AG6—Turbo-Drive, a modern, economical method of moving sand or flowable materials vertically and horizontally to point of use. One operator, controlling all operations from material mixing source, can deliver as much as a ton or more of material to any desired location in a few seconds. Installation is simple and inexpensive, since delivery pipes may be run through or between existing structures. Operating on air pressure, units are available in 7, 15, and 30 cu ft capacities. *Crane Co.*

Rotary Floor Brush

AG7—Series M-100 circular brushes, suitable for use on all types of powered rotary floor cleaning machines, feature concave bristle trim to insure thorough cleaning and maximum efficiency. When brushes are in operation, outer rows of bristles

flare for equal contact of all bristles with floor surface. Available with four types of bristles: (1) flat steel wire for heavy duty cleaning, (2) round steel wire for medium-duty cleaning requirements, (3) non ferrous beryllium bristles for locations where sparks are a hazard, and (4) durable fibre bristles for use on hardwood, linoleum,

(Continued on Page 77)

FLY-ASH COSTS YOU MONEY...

in good-will... in expensive repairs!

THE WATER CURTAIN

CUPOLA COLLECTOR

WILL CLEAN-UP YOUR OPERATION

Fly-ash from your cupola can be a costly nuisance.

The deteriorating action on house paint, roofs, gutters on property adjacent to your plant may develop into a serious public relations problem.

Fly-ash is indeed expensive when it destroys your own facilities and requires repair or replacement of roofs, window sash, gutters, stacks, motors and other equipment.

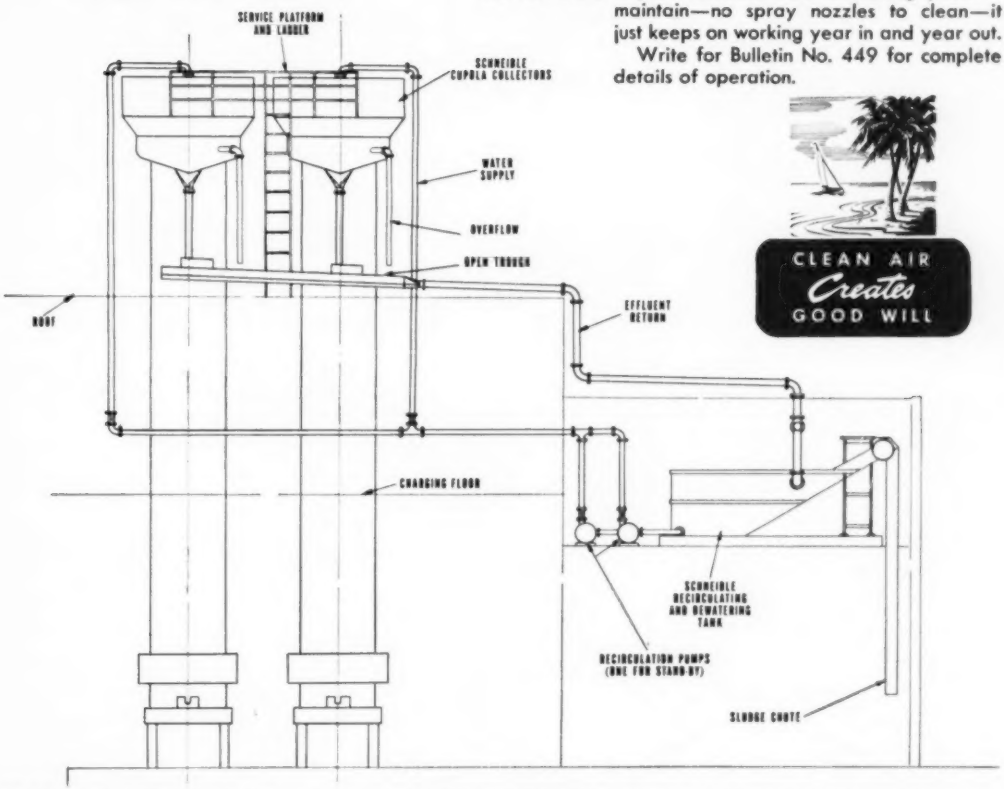
The Schneible Water Curtain type Cupola Collector reduces fly-ash to a minimum—cuts top side maintenance costs and eliminates fire hazard for yourself and neighbors.

Continuous recirculation of water through this collector picks up dust and sparks and returns them to a dewatering tank in the form of harmless, easily disposable sludge.

The Schneible Cupola Collector has no moving parts to maintain—no spray nozzles to clean—it just keeps on working year in and year out.

Write for Bulletin No. 449 for complete details of operation.

CLEAN AIR *Creates* GOOD WILL



CLAUDE B. SCHNEIBLE CO. • P.O. BOX 502—ROOSEVELT ANNEX • DETROIT 32, MICHIGAN

SCHNEIBLE

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

KEOKUK ELECTRO-METALS COMPANY Keokuk, Iowa • *Wenatchee Division: Wenatchee, Washington*

SALES AGENTS: Miller and Company
332 S. Michigan Avenue, Chicago 4, Illinois • 3504 Carew Tower, Cincinnati 2, Ohio • 407 N. Eighth Street, St. Louis 1, Missouri

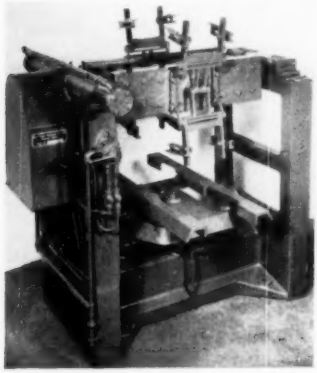
asphalt, tile, etc. Illustrated is 17¼ in. diameter M-100-R brush, weighing 8 lb and having more than 600 sets of round steel wire bristles. *Malish Brush and Specialty Co.*

Chaplet

AG8—New type chaplet, developed by Battelle Memorial Institute, is claimed to effect more perfect fusion between chaplet and casting by means of three exclusive features: (1) Countersunk Shoulder that permits metal to flow naturally against entire contour, eliminating gas, which frequently creates voids under conventional fitted head or welded stem chaplets; (2) Featheredge Fusion Rings whose knifelike edges heat instantly, completely sealing casting against leaks, and (3) Radius Grooves which permit metal to roll into base of grooves without trapping gases and creating voids caused by sharply threaded or deformed stems. *Fanner Mfg. Co.*

Core Blower Accessory

AG9—Newly-developed accessory for core blower consists of two identical units which are placed one on each side of a core blower which has been raised to a table height of 44 in. This allows core removal at 22 in. from floor, keeping operator erect at all times. Each machine is equipped with two core boxes. When one box is taken from core blower, dryer is installed. Operator moves lever to clamp dryer, then moves valve on machine leg, causing box and machine frame to roll over by power. When core box has moved into draw location, table rises automatically to unclamp, vibrate and draw without operator's assistance. Operator merely rolls empty box to blower for refill and core removal from machine table to either conveyor or oven. Machine is adaptable to many core box sizes. Unit is also available with feature that permits core box to pass through and around gravity roller circle. *Sutter Products Co.*



Heat Resistant Paint

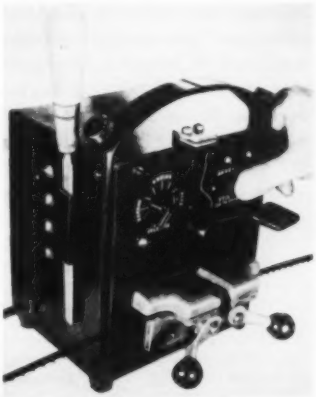
AG10—Aluminum paint that can be applied like ordinary paint and without primer protects metals subject to temperatures ranging from 500 F to 1200 F. Tecosteel paint air dries in 12 to 18 hours and can be baked dry at 350 F in 15 min. It can be brushed, sprayed or dipped and resists both salt spray and humidity. Manufacturer recommends paint for annealing boxes and furnaces, industrial ovens, hot smoke stacks, hot air ducts and superheated steam lines. *Thompson & Co.*

Lifting Fork Truck

AG11—Complete new series of heavy duty lift trucks are available in three sizes —5, 7½ and 10 ton capacities. Dual pneumatic traction tires mounted on dead axle support chassis and fork load, relieving differential load. Lifting and tilting hydraulic units are oversize. Other features: interlocked lifting guides for perfect alignment, improved operator vision and liberal ground clearance. Special attachments are available. *Silent Hoist & Crane Co.*

Saw Blade Welder

AG12—Portable, automatic saw blade welder for bandsawing machines permits on-the-spot welding and annealing of saw blades up to 1½ in. in width. Welder makes consistently smooth, strong welds in joining saw blades to fit any size machine and eliminates brazing and delay in repairing broken saw bands. Cam-operated jaws quickly align blade ends. Weld selector automatically provides correct spring tension to welding jaw for welding blade widths varying from 1/16 in. to 1/2 in. Pushbutton switch controls correct amount of heat for annealing. *Do-All Co.*



Belt Conveyors

AG13—Redi-Fab belt conveyors, available in 19 lengths and 3 widths, are packaged into simple components for greatest number of combinations. Series includes five drives with partial reductions for use in driving conveyor from power take-off shaft of other equipment, such as crushers. Series also includes reciprocating, apron and belt feeders.

Reader Service, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago: **Please send me literature on the following items indicated below, without charge or obligation:**

AG 1	AG 5	AG 9
AG 2	AG 6	AG 10
AG 3	AG 7	AG 11
AG 4	AG 8	AG 12
		AG 13

Name ..... Title .....

Company .....

Address .....

City ..... State .....

FOUNDRY Literature

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Refer to the items by means of the convenient code numbers.

Electric Arc Furnaces

AG101—Hydro-Arc electric arc furnaces are described in a 10-page, illustrated catalog which discusses advantages, costs and features. Design of electrode arms and clamps and method of electrode positioning is described and illustrated with large photos and drawings. Included is a simple four-page questionnaire designed to aid prospective users in specifying furnaces to fit their particular needs. *Whiting Corp.*

Non-Metallic Abrasive

AG102—Four-page bulletin describes properties and applications of Black Beauty, a non-metallic, silica-free blast grit. This sharp, fast-cutting abrasive retains its abrading qualities even when reduced to very fine material and although it has same properties as sand, has no free silica to create an occupational hazard. Claimed by manufacturer to wear two to five times longer than sand and to be less damaging to equipment, Black Beauty is non-corrosive, stainless, rustless, flows freely, will not attract moisture and does not pack or harden. *American Wheelabrator & Equipment Corp.*

Letters and Figures

AG103—Covering 86 major styles of letters and figures designed for exterior and interior use on offices, stores, factories, banks and institutions, Catalog No. 28 lists sizes, types of metal available, width and thickness of each style of letter. *H. W. Knight & Son, Inc.*

Refractory Jointing Material

AG104—Metaltite, a refractory jointing material with high resistance to molten metal and slag, is described in a four-page, illustrated folder. Developed specifically for iron and steel industry applications, Metaltite lays up fire clay brick subjected to excessive high temperatures, skulls and slags due to molten metal oxides. Described in folder are applications in ladles, mixer type hot metal cars, malleable furnaces, forehearths and receiving ladles. Also given are useful facts on linings and instructions for preparation and mixing of Metaltite. *Laclede Christy Co.*

Wet Sand Reclamation

AG105—Twelve-page bulletin describes the Hydro-Blast system of wet sand reclamation. Included in bulletin are testimonials of users of this system, tables of steel foundry sand recovery costs and comparison of new and reclaimed foundry sands, a chart showing reclaimed sand vs. new lake sand as to permeability, water content, green compression, tensile strength and gas. Also included is a two-page diagrammatic drawing of the Hydro-Blast sand reclamation system and complete listing of advantages and applications of this system to the foundry. *Hydro-Blast Corp.*

Core Hardness Tester

AG106—Illustrated specification sheet describes Gordon-Campbell core hardness tester, developed to obtain values for relative hardness of any core surface. Hardness values are obtained by measuring depth to which an abrading point moves into material when it is under constant force for a definite travel. Calibrating spring exerts pressure of 16 oz on abrading point, which moves in $\frac{5}{8}$ in. circle. Three revolutions of abrading point are required to make test. Maximum hardness indicated by tester is 100 for zero penetration. Intermediate values can be found from table of Gordon-Campbell core hardness numbers. *Claud S. Gordon Co.*

Hydraulic Cylinders

AG107—Eight-page folder, illustrated with photographs, charts and tables, provides data on Miller 2000 psi hydraulic cylinders, piston ring seal cylinders and precision seal cylinders. Comprehensive charts show complete mounting data on 16 high-pressure hydraulic cylinder models, while tables show bores and instructions for finding standard piston rod and bushing dimensions. Double-page illustration shows feature of 2000 psi hydraulic cylinder. Concluding bulletin is page of engineering data covering piston rods, seals, fluids, mounting and bleeding, piping, pressures, etc. *Miller Motor Co.*

Colloidal Graphite Dispersions

AG108—Bulletin 125 describes use of "dag" colloidal graphite dispersions in the foundry. Properties of colloidal graphite include resistance to heat and anti-friction properties. Use of Aquadag, Prodag and other "dag" dispersions for coating of chills, molds, mold cavities and patterns; for the treatment of gates, risers and runners, and for lubrication of shoulder screws, base plates and push pins is fully described by formula with helpful suggestions for application. *Acheson Colloids Corp.*

Pressure Regulators

AG109—Third in a projected series of 10, new 32-page catalog covers complete line of pressure regulators, including regulators for cutting, special flame processes, welding, maintaining gaseous pressures in electrical equipment, and other operations where controlled gas pressure is required. Section covers regulator adapters and pressure gages and flow and pressure charts are included. *Air Reduction Sales Co.*

Reader Service, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago: Please send me literature on the following items circled below, without charge or obligation:

AG101	AG104	AG107
AG102	AG105	AG108
AG103	AG106	AG109

Name..... Title.....

Company.....

Address.....

City..... State.....

BOOK NUMBER		MEMBER PRICE	LIST PRICE
1	Alloy Cast Irons Handbook (2nd Edition)	$2.75	$ 4.50
2	Aluminum Foundry Process Control (SAE)	1.00	2.50
39	AFS Foundry Apprentice Course Outline	1.00	2.00

BOOKS . . . . TO MEET THE CURRENT NEEDS OF THE FOUNDRY INDUSTRY

THE RESULTS OF 14 YEARS OF EFFORT BY NON-FERROUS LEADERS

Recommended Practices for Sand Casting

non-ferrous alloys

FIRST EDITION $4.00 LIST

MEMBER PRICE $2.25

NEVER BEFORE PUBLISHED

An indispensable book wherever Non-Ferrous Metals are cast, completing 14 years' work in setting up approved, up-to-date practices for production of Non-Ferrous Alloy Castings. Scores of leading foundrymen and metallurgists contributed material for it.

Published Exclusively by

AMERICAN FOUNDRYMEN'S SOCIETY

29	AFS Apprentice Training Standards for the Foundry Industry	1.00	2.00
27	AFS "Transactions" Vol. 51 (6x9)	3.00	15.00
30	AFS "Transactions" Vol. 53 (8½x11)	4.00	15.00
31	AFS "Transactions" Vol. 54 (8½x11)	4.00	15.00
32	AFS "Transactions" Vol. 55 (8½x11)	4.00	15.00
33	AFS "Transactions" Vol. 57 (8½x11)	8.00	15.00
3	Analysis of Casting Defects	2.50	4.25
35	Bibliography of Centrifugal Casting	1.50	2.25
4	Cast Metals Handbook (3rd Edition)	4.50	7.50
6	Classification of Foundry Cost Factors	1.00	2.00
7	Cupola Operations Handbook	6.00	10.00
8	Development of the Metal Castings Industry	5.00	8.50
38	Foundry Core Practice (2nd Edition)	6.50	10.00
9	Foundry Cost Methods	1.50	3.00
10	Foundry Dust Control	1.00	2.00
11	Foundry Process Control (SAE)	1.50	2.50
12	Foundry Sand Testing Handbook (5th Edition)	2.25	4.00
37	85-5-5-5 Test Bar Design	1.00	2.00
13	Gating and Heading Malleable Iron Castings	1.50	2.50
14	Gating Terminology Chart (Discount on quantity lots)	.10	.25
15	Graphitization of White Cast Iron	2.25	4.00
34	Guide for Foreman Training Conferences	1.50	2.25
36	Index to AFS "Transactions" (1930-1940)	1.00	2.00
16	Malleable Foundry Sand and Core Practice	2.00	3.25
17	Malleable Iron Melting	2.25	4.00
18	Permanent Mold Castings Bibliography	1.50	3.00
19	Recommended Good Practice Code and Handbook on the Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems	3.00	5.00
20	Recommended Good Practices for Metal Cleaning Sanitation	1.25	2.25
21	Recommended Good Safety Practices for the Protection of Workers in Foundries	1.25	2.25
22	Recommended Practices for Grinding, Polishing and Buffing Equipment Sanitation	.60	.60
23	Recommended Practices for Industrial Housekeeping and Sanitation	1.00	2.00
24	Recommended Practices for Sand Casting Aluminum and Magnesium Alloys	1.00	1.75
25	Recommended Practices for the Sand Casting of Non-Ferrous Alloys	2.25	4.00
26	Tentative Code of Recommended Practices for Testing and Measuring Air Flow	1.00	2.00

AMERICAN FOUNDRYMEN'S SOCIETY
616 SOUTH MICHIGAN AVENUE
CHICAGO 5, ILLINOIS

Please send the books circled below.

$_____ remittance enclosed.

1	2	3	4	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	29	30	31	32	33	34	35
36	37	38	39							

Name _____

Address _____

City _____

Zone _____ State _____

Company _____

AFS pays postage when remittance accompanies order.

IDEAS FOR MODERNIZATION

MOULDS CLEANED MORE THOROUGHLY AND SAFELY WITH HOFFMAN HEAVY-DUTY VACUUM CLEANING

Removes sand and shot quickly from even the most intricate castings — without danger of compressed air blowing. Fewer cut-eye cases. A cleaner plant — fewer rejects — higher worker morale. Cleans overhead areas as well as floors, gangways, pattern shops fast, thoroughly. Heavy-duty portables and stationary systems to fit every plant requirement. Write for literature and FREE Survey.

AIR APPLIANCE DIVISION

U.S. HOFFMAN MACHINERY CORPORATION

99 FOURTH AVENUE, NEW YORK 3, N. Y.

CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO., LTD., NEWMARKET, ONT.

Quantity PRODUCTION of GREY IRON CASTINGS

*

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

*

ESTABLISHED 1868

THE WHELAND COMPANY

FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

GLOSSARY

(Continued from Page 54)

cast steel—Any object made by pouring molten steel into molds.

cast structure—The structure, on a macroscopic or microscopic scale, of a cast alloy that consists of cored dendrites and, in some alloys, a network of other constituents.

caustic dip—Immersion in a solution of sodium hydroxide to clean the surface or, when working with aluminum alloys, to reveal the macrostructure.

cavitationerosion—Damage to a material in contact with a moving liquid, associated, with formation and collapse of cavities in the liquid at the solid-liquid interface.

cementite—A compound of iron and carbon known as "iron carbide" which has the approximate chemical formula Fe_3C and is characterized by an orthorhombic crystal structure.

center line—Well-defined gage line placed on the work to serve as a basis from which dimensions are to be measured.

centrifugal casting—A casting technique in which the mold is rotated during solidification of the casting; unusually sound castings may be produced by action of centrifugal force pressing toward the periphery.

chamfer—To bevel a sharp edge.

chamotte—Coarsely graded refractory molding material, prepared from calcined clay and ground firebrick mulled with raw clay, used in steel foundries.

chaplets—Metallic supports or spacers used in molds to maintain cores, or parts of the mold which are not self-supporting, in their proper position during the casting process; not used when a pattern has a core print which serves the same purpose.

charcoal—Used in pulverized form as dry blacking, or in suspension with clay, as black wash.

charge—A given weight of metal or fuel introduced into the cupola or furnace.

charging door—Opening in cupola or furnace through which the charges are introduced.

Charpy test—A pendulum type of impact test in which a specimen, supported at both ends as a simple beam, is broken by the impact of the falling pendulum. The energy absorbed in breaking the specimen, as determined by the decreased rise of the pendulum, is a measure of the impact strength of the metal. See IZOD TEST.

cheeks—Intermediate sections of a flask that are inserted between cope and drag to decrease the difficulty of molding unusual shapes or to fill a need for more than one parting line.

chill—A piece of metal inserted in the mold at the surface of a casting to hasten solidification of heavy sections and cause the castings to cool at a uniform rate.

chill-cast pig—Pig iron cast into metal molds or chills; if a machine is used the product is known as "machine-cast pig."

chilled iron—Cast iron in which the carbon is retained in combined form in certain areas sufficient to form a mottled or

white structure due to conditions which accelerate cooling to the extent that normal graphitization is prevented in those areas.

chills—Metallic inserts located in positions in sand molds where rapid cooling is desired.

Chinese script—A configuration typical of the constituents in cast aluminum alloys containing specific amounts of iron and silicon; applies also to a similar structure found in magnesium alloys containing silicon.

chipping—Removal of fins and other excess metal from castings by means of chisels and other suitable tools.

chipping-out—The process of removing slag and refuse attached to the lining of the cupola or furnace after a heat has been run.

chlorination—A metal refining process wherein chlorine gas is passed through molten magnesium alloys to remove dissolved gases and entrapped oxides from the molten metal.

chrome pickle—A chemical treatment for magnesium in a nitric acid, sodium dichromate solution; gives some protection against corrosion by producing a film that is also a base for paint.

Cire-Perdue process—See LOST WAX PROCESS.

clamp-off—An indentation in the casting surface due to displacement of sand in the mold.

clays—Hydrous silicates of alumina, more or less mingled with mineral impurities and colored by presence of metallic oxides and organic matter. Pure clay is an earth which possesses sufficient ductility and cohesion, when kneaded with water, to form a paste capable of being fashioned by hand, and is capable of resisting intense heat.

clay substance (A.F.S. clay)—Earthy portion of foundry sand which, when suspended in water, fails to settle 1 in. per min and which consists of particles less than 20 microns (0.02 mm or 0.0008 in.) in diameter.

clay-wash—Thin emulsion of clay and water for coating gaggers and the inside of flasks.

cleaner—A tool of thin steel or brass, 16 to 18 in. long, one extremity has a bent spatula blade; the other, a short blade bent on the flat to a right angle; used for smoothing the molded surfaces and removing loose sand; also called a sleeker.

coal dust—Used largely in green sand molding compositions for cast iron; a bituminous type of coal is selected with a high percentage of volatile matter, crushed to various grades (coarse to super fine) and additions of 5 to 10 per cent added to the facing sand.

cohesion—The force by which particles are held together. It varies with different metals, and depends upon hot or cold working as well as upon molecular arrangement due to heat treatment.

coinage metals—Alloys of gold or silver with nickel or copper, used for minting coins.

coining—A process of forming metals by pressing them to size and to close tolerances.

(Continued on Page 85)

YOU DON'T HAVE TO BE A CHEMIST! -there's an EASIER WAY to know you have the BEST - just use
CONSISTENTLY HIGH QUALITY NATIONAL BENTONITE
NATIONAL
BENTONITE

If you really want to make laboratory tests, we're happy to have you make them. Because we know that any tests you make will prove that National Bentonite is high in every quality you want in bentonite. Lots of good foundrymen use National Bentonite because their experience has proved that it is *consistently, uniformly*, tops in quality.

ORDER NATIONAL BENTONITE FROM THESE APPROVED DISTRIBUTORS

American Cyanamid Co.
New York, New York

The Asbury Graphite Mills, Inc.
Asbury, New Jersey

Barada & Page, Inc.
Kansas City Missouri (main office)
Also—(Branches)
Tulsa, Okla.
Oklahoma City, Okla.
Wichita, Kansas
Dallas, Texas
Houston, Texas
New Orleans, La.

G. W. Bryant Core Sands, Inc.
McConnellsville, New York

Canadian Industries, Ltd.
Montreal, Quebec, Canada
(all branches)

Lloyd H. Canfield Foundry Supplies
1721 Minnesota Ave.,
Kansas City, Kansas

Casco S. de R. L., Mexico, D. F.

The Foundries Materials Co.
Coldwater, Michigan
Also Detroit, Michigan

Foundry Service Company
North Birmingham, Alabama

Foundry Supplies Co.
Chicago, Illinois

Robert C. Penner
Interstate Supply & Equipment Co.
647 West Virginia St.,
Milwaukee 4, Wis.

Independent Foundry Supply Co.
Los Angeles, California

Industrial Supply Co.
San Francisco, California

Klein-Farris Co., Inc.
Boston, Massachusetts
New York, New York
Hartford, Connecticut

LaGrand Industrial Supply Co.
Portland, Oregon

Marthens Company
Moline, Illinois

Carl F. Miller & Co.
Seattle, Washington

Pennsylvania Foundry Supply & Sand Co.
Philadelphia, Pennsylvania

Robbins & Bohr
Chattanooga, Tennessee

Smith-Sharpe Company
Minneapolis, Minnesota

Southwest Foundry Supply Co.
Houston, Texas

Steelman Sales Co.
Chicago, Illinois

Stoller Chemical Co.
Akron, Ohio

Wehenn Abrasive Co.
Chicago, Illinois

Mr. Walter A. Zeis
Webster Groves, Missouri

BAROID
SALES DIVISION
NATIONAL LEAD COMPANY

BENTONITE SALES OFFICE
RAILWAY EXCHANGE BLDG.
CHICAGO 4 • ILLINOIS

FOUNDRY FIRM Facts

Great Lakes Carbon Corp. recently purchased the coke plant of the **Laclede Gas Light Co.,** St. Louis, and will produce metallurgical coke for use in foundries, blast furnaces, etc. The newly-purchased plant has 56 Koppers ovens and eight Piette ovens, with a production capacity of approximately 250,000 tons of coke annually. Frederick G. Poeter and Ralph H. Stover of Great Lakes Carbon Corp. have been temporarily assigned to the St. Louis operation. Three top operating men whose combined experience with the Laclede Gas Light Co. totals 88 years have joined Great Lakes Carbon Corp. and will continue to serve in their former capacities with the new owner. They are E. W. Blind, superintendent; John Adolphson, assistant superintendent; and Joseph Kohlberg, chief chemist. The new owner has been in the coal and coke industry since 1919, operating quarries and plants in 17 states. Headquarters of the parent company, which is incorporated in Delaware, are at 18 East 48th St., New York City.

American Smelting & Refining Co., announces reorganization of sales and distribution plans for its Continuous-Cast brass and bronze products. Continuous-Cast products, formerly distributed through **Ampco Metal, Inc.,** Milwaukee, will be handled by ASARCO representatives in 37 states, with **Kingwell Bros., Ltd.,** San Francisco, handling the Western area. New sales and distribution will be directed from the company's Perth Amboy, N. J. plant, with John R. Kimberley as sales manager; Ralph W. Bailey and John V. Hackett as assistant sales managers; and Donald S. Goebel, who handled Continuous-Cast for Ampco Metal, Inc., heading the new setup at the company's Whiting, Ind., plant. The ASARCO process for Continuous-Casting makes available a wide range of alloys in a form equivalent in dimension, uniformity and soundness to long mill rods, tubes and shapes. Substantial stocks are maintained at the company's Perth Amboy and Whiting plants for convenience in distribution.

Guardian Safety Equipment Co., Birmingham, Ala., has been appointed distributor for **Chicago Eye Shield Co.'s** line of head and eye protection equipment in Alabama and Mississippi. Howard Freed, formerly with Williams & Co., Ohio industrial distributors, will head the organization. Offices and stocks will be maintained at 4215 First Ave., N., Birmingham.

Hapman Conveyors, Inc., Detroit, and **C. H. Dutton Co.,** Kalamazoo, Mich., have merged into a new company to be known as **Hapman-Dutton Co.,** with H. W. Hapman as president and general manager and Robert J. Brown as vice-president and treasurer. The new company will consist of the Hapman Conveyors Division, with Peter P. Ruppe in charge, and the Dutton Boiler Division, headed by J. David. Hapman Conveyors Div. will have its sales office at 19209 W. Davison Ave., Detroit 23, and Dutton Boiler Div. at 630 Gibson St., Kalamazoo, Mich.

Mine Safety Appliances Co., Pittsburgh, recently dedicated what is said to be the world's largest research laboratory devoted to the development of safety equipment for industry. Facilities wil be used to develop equipment and devices to combat all types of industrial hazards, including safety equipment and instruments for such relatively new fields as air pollution and atomic energy. The four-story laboratory building houses high-altitude chambers; dust, fume and gas chambers; a wind tunnel and an electron microscope capable of 100,000 magnification. A library contains comprehensive literature on safety, industrial health and hygiene.

Canadian Car & Foundry Co. was recently host at its Longue Point and Turcot plants to high school teachers of the Montreal area. Organized by the Montreal Board of Trade in cooperation with school boards and the company, the tour began with an address of welcome by CC&F President V. M. Drury in the head office board room, then proceeded to an inspection of Longue Point in the morning and Turcot in the afternoon. Company executive personnel conducted the tour and gave brief talks on CC&F resources, aims and policies. The meeting concluded with a color motion picture on bus production at the Fort William plant.

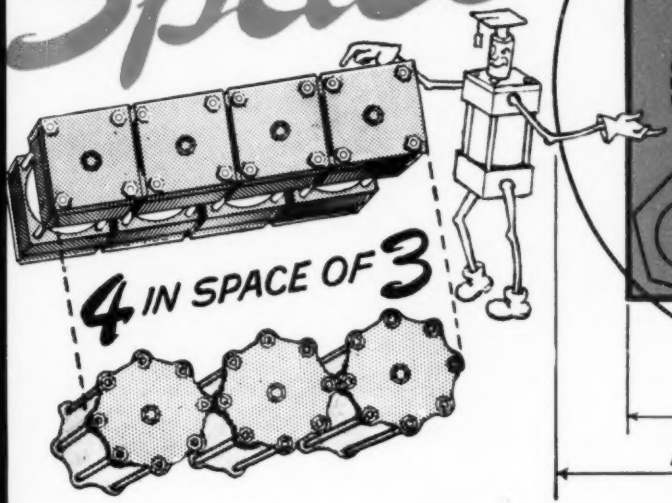
Whiting Corp., Harvey, Ill., announces a new distributing policy for its Merchandise Sales Division, whose line of materials handling equipment has been completely reorganized and expanded during the past year. In addition to 12 sales territories now organized and manned, materials handling distributors are being appointed from the ranks of established industrial distributors, hardware wholesalers and automotive equipment jobbers. Waldie & Briggs, Inc., Chicago advertising agency, has been named to direct a comprehensive advertising and sales promotion campaign.

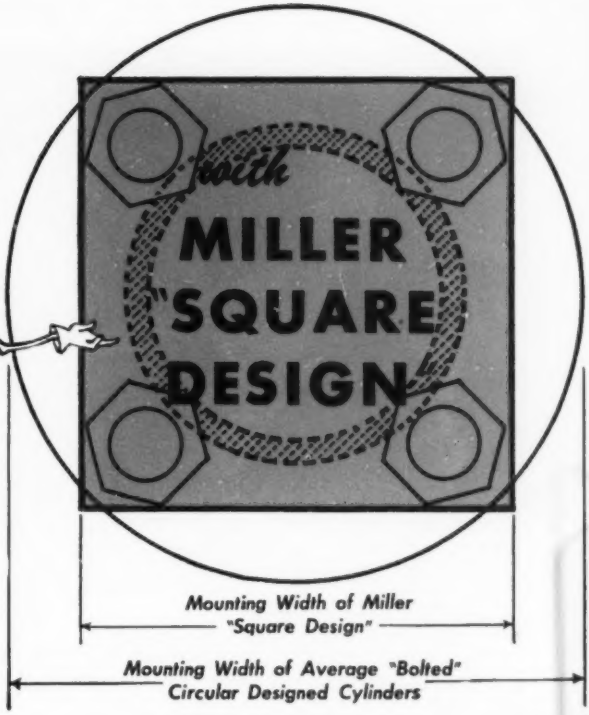
Formation of **Dura-Lite Casting Corp.,** Danville, Ill., has been announced by Dean A. Harrington, president and general manager. M. P. Hall, president, Hall Freight Lines, and R. R. Bookwalter, president, Coffing Hoist Co., both of Danville, are members of the corporation. The New Industries Committee of the Danville Chamber of Commerce assisted in the organization of the foundry which is producing standard bronze and aluminum sand castings.

Hansell-Elcock Co. has completed a new pattern storage building at 185 West 23rd Place, Chicago, to replace facilities destroyed last year by fire. The new building contains 20,000 sq ft of floor space, is equipped with overhead cranes and unit heaters and provides year-round temperature controlled storage for customers' pattern equipment. Molding machines and a new sand system have been installed.

This four-place airplane is used by Foundries Materials Co., Coldwater, Mich., to make fast, emergency deliveries of materials to foundries, to transport company personnel and to keep in closer touch with sources of supply. Standing on wing is Douglas J. Strong, president of the company.

Save Space





Benefits to You!

- More Cylinder Power in Same space
- Solve "Limited Space" Problems
- Simplify Designing and Installation
- Save hours of Drafting Time

Air *and* Hydraulic CYLINDERS...

The SQUARE DESIGN of Miller Cylinders saves up to 25% of mounting space, permitting more cylinder power in the same space and easier, more convenient installation in "tight spots." Thus, in many cases, machines and equipment can be designed more compact and less costly by using Miller Cylinders. Hours of drafting time can be saved — as only a few straight lines show any view on drawings.

The illustration at upper left shows graphically how *four* Miller Cylinders can be mounted, bore for bore, in the same space required for *three* average "bolted" circular designed cylinders. Some Miller bore sizes permit even greater space-savings.

Other important *standard* features of all Miller Cylinders include: solid steel heads, caps and mountings, hard chrome plated piston rods, dirt wiper seals, and other "quality" features as shown in illustrated bulletins sent FREE on request. Remember, too, that Miller Hydraulic Cylinders (2000-3000 psi) meet the J. I. C. Hydraulic Standards.

Write for illustrated cylinder bulletins A-105 and H-104

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION. LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI. HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

MILLER MOTOR COMPANY

4027-29 N. KEDZIE AVE., CHICAGO 18, ILLINOIS

AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR HOISTS

CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON — HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS — MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE — ST. LOUIS and OTHER AREAS.

Sales and Service from coast to coast

CAST IN NICKEL-CHROMIUM IRON, by the Atlantic Foundry Company of Akron, Ohio, this lead melting pot is used in a large rubber plant. It is subjected to temperatures ranging from 620° to 950° F. 24 hours per day. The pot has an inside diameter of 81", is 42" deep and weighs 7,520 lbs.

LICK scaling...distortion...thermal shock ...with *NICKEL CAST IRON*

To assure long service life, this giant lead melting pot was produced in a cast iron containing 1.75% nickel and 0.75% chromium.

This and similar compositions have shown marked superiority to unalloyed iron in applications that call for resistance to destructive effects of moderately high temperatures.

Hundreds of progressive foundries now use nickel to secure these basic advantages:

IN THE FOUNDRY—Nickel aids the progressive foundry to meet high mechanical property specifications. It is employed in the production of engineering cast irons because it strengthens the pearlitic matrix of the iron, produces finer and more highly dispersed graphite and discourages the formation or retention of hard carbide particles.

IN THE MACHINE SHOP—Nickel cast irons provide readily machinable castings that take a smooth finish because of their improved structure and uniformity, particularly where changes in cross-section introduce difficulties and losses with unalloyed irons.

IN SERVICE—Nickel cast irons are strong and pressure-tight, thereby eliminating a frequent source of trouble in pumps, valves, pipes and fittings.

Ask us for information about the advantages nickel alloyed irons provide for specific applications. Write us today.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

GLOSSARY

(Continued from Page 81)

cold short—A characteristic of metals that are brittle at ordinary or low temperatures.

cold shot—Small globule of metal embedded in, but not entirely fused with, the casting.

cold shut—A casting defect caused by imperfect fusing of molten metal coming together from opposite directions in a mold.

collapsibility—The tendency of a sand mixture to break down under the conditions of casting.

colloids, colloidal material—Finely divided material less than 0.5 micron (0.00002 in.) in size, gelatinous, highly absorbent and sticky when moistened.

columnar structure—A coarse structure of parallel columns of grains, which is caused by highly directional solidification resulting from sharp thermal gradients.

combination core box—A core box that may be altered to form a core of another shape.

combined carbon—Carbon in iron and steel which is combined chemically with other elements; not in the free state as graphite carbon.

combined water—That water in mineral matter which is chemically combined and driven off only at temperatures above 230 F, 110 C.

combustion—Chemical change as a result of the combination of the combustible constituents of the fuel with oxygen producing heat.

compressive strength (sand)—Maximum stress in compression which a sand mixture is capable of developing.

compressive strength—Maximum stress that a material, subjected to compression, can withstand without a predefined amount of deformation.

continuous annealing furnace—A furnace in which castings are annealed by passing through different zones which are kept at constant temperatures.

continuous casting—A casting technique in which the ingot is continuously solidified while it is being poured, and the length is not determined by mold dimensions.

continuous electrode—In an electric-arc furnace, a type of electrode that is replenished as it is consumed.

continuous phase—In alloys containing more than one phase, the phase that forms the matrix or background in which the other phase or phases are present as isolated units.

contraction cracks—A crack formed by the metal being restricted while it is contracting in the mold; may occur just after solidification (called a *hot tear*) or a short time after the casting has been removed from the mold.

contraction rule—A scale divided in excess of standard measurements, used by patternmakers, and thus avoiding calculations for shrinkage.

controlled cooling—A process of cooling from an elevated temperature in a predetermined manner, to avoid harden-

(Continued on Next Page)

SEMET-SOLVAY FOUNDRY COKE

PRACTICAL—SEMET-SOLVAY metallurgists are practical foundrymen who are always glad to help with your melting problems. Their services go along with the use of Semet-Solvay Foundry Coke.

SEMET-SOLVAY DIVISION
Allied Chemical & Dye Corporation
CINCINNATI • DETROIT • BUFFALO
In Canada: SEMET-SOLVAY COMPANY, LTD., TORONTO

for Better Melting

LADLES

• ALL CAPACITIES
• ALL TYPES *Including*
TIMKEN WORM GEARED LADLES

LADLES • BOWLS • SHANKS • SPECIAL EQUIPMENT • TONGS • BAILS

Catalog Available

Industrial EQUIPMENT COMPANY
115 N. OHIO ST. • MINSTER 1, OHIO

7 WAYS SAND CONTROL SAVES MONEY

Use NEWLY DEVELOPED TEST VALUES

1 EASIER MOLDING

Green Strength
Green Deformation
Flowability
Moisture
Rammability

2 EASIER CORE MAKING

Green Strength
Blowability
Sagging Resistance
Cracking Resistance
Stickiness
Moisture

3 BETTER MOLD CONDITION

Green Hardness
Air Set Strength
Dry Strength

4 BETTER CORE CONDITION

Dry Hardness
Core Strength
Core Deflection
Moisture Absorption
Gas Pressure

5 CASTING APPEAL

Permeability
Clay Substance
Fineness
% Combustible

6 CASTING QUALITY

Hot Strength
Hot Deformation
Expansion
Spalling

7 EASIER SHAKE-OUT

Retained Strength

Write for Free New "Foundry Sand Practise" Book

CONTROL EQUIPMENT

HARRY W. DIETERT COMPANY

9330 ROSELAWN • DETROIT 4, MICH.

GLOSSARY

(Continued from Preceding Page)

ing, cracking or internal damage, or to produce a desired microstructure.

converter—A furnace in which air is blown through the molten bath or crude metal for the purpose of oxidizing impurities.

cooling stresses—Stresses developed by uneven contraction or external constraint of metal during cooling after pouring.

cope—Upper or topmost section of a flask, mold or pattern.

coping out—The extension of sand of the cope downward into the drag, where it takes an impression of a pattern.

core—A preformed baked sand or green sand aggregate inserted in a mold to shape the interior or that part of a casting which cannot be shaped by the pattern.

core blowing machine—A machine for making of cores by blowing sand into the core box.

core box—Wood or metal structure the cavity of which has the shape of the desired core which is to be made therein.

core breaker—A machine for crushing cores or for removing cores from castings.

core cavity—The interior form of a core box that gives shape to the core.

core compound—A commercial mixture to supply the binding material needed in making cores.

core driers—Sand or metal supports used to keep cores in shape while being baked.

core frame—Frame of skeleton construction used in forming intermediate and large cores.

core irons—Bars of iron embedded in a core to strengthen it.

core knockout machine—A mechanical device for removing cores from castings.

coremaker—A craftsman skilled in the production of cores for foundry use.

core marker—A core seat so shaped or arranged that the core will register correctly in the mold.

core oil—Linseed-base or other oil used as a core binder.

core ovens—Low-temperature ovens used for baking cores.

core paste—A prepared adhesive for joining sections of cores.

core plates—Heat-resistant plates used to support cores while being baked.

core print—A projection on a pattern which forms in the sand of the mold an impression into which the core is laid.

core raise—A casting defect caused by a core moving toward the cope surface of a mold causing a variation in wall thickness.

core sand—Sand free from clay, of nearly pure silica; any sharp sea sand.

core shift—A variation from specified dimensions of a cored section due to a change in position of the core or misalignment of cores in assembling.

coring—Variable composition in solid solution dendrites; the center of the dendrite is richer in one element, as shown by the pertinent solidus-liquidus lines in a phase diagram.

cover core—A core set in place during the ramming of a mold to cover and complete a cavity partly formed by the withdrawal of a loose part of the pattern.

creep—Gradual continuous distortion of metal under constant stress.

critical points—Temperatures at which changes in the phase of a metal take place. They are determined by liberation of heat when the metal is cooled and by absorption of heat when the metal is heated, thus resulting in halts or arrests on the cooling or heating curves.

crossbar—Wood or metal bar placed in a cope to give greater anchorage to the sand than is afforded by its four walls.

cross section—A view of the interior of an object that is represented as being cut in two, the cut surface presenting the cross section of the object.

crucible—A ceramic pot or receptacle made of graphite and clay, or clay and other refractory material, used in melting of metal; sometimes applied to pots made of cast iron, cast steel or wrought steel.

crush—An indentation in the casting surface due to displacement of sand in the mold.

cupola—A small type of blast furnace lined with refractories for melting metal in direct contact with the fuel by forcing air under pressure through openings near its base.

cupola tender—Person responsible for operating a cupola.

cupping—The tendency of tangential sawed boards to curl away from the heart of the tree.

cuts—Defects in a casting resulting from erosion of the sand by metal flowing over the mold or cored surface.

cutting over—Turning over sand by shovel or otherwise to obtain a uniform mixture.

cutting shellac—Dissolving shellac in alcohol.

D

damping capacity—Ability of a metal to absorb vibrations, changing the mechanical energy into heat.

daubing—Filling cracks in cores, or plastering a cupola after the heat, or plastering ladle linings.

decarburization—Loss of carbon from the surface of a ferrous alloy as a result of heating in a medium that reacts with the carbon.

deep etching—Macro-etching; etching, for examination at low magnification, in a reagent that attacks the metal to a much greater extent than normal for microscopic examination. Gross features may be developed, i.e., abnormal grain size, segregation, cracks.

deformation (sand)—Change in a linear dimension of a sand mixture accompanied by a stress.

dendrite—A crystal formed usually by solidification and characterized by a treelike pattern composed of many branches; also termed "pine tree" and "fir tree" crystal.

dezincification—Corrosion of an alloy containing zinc (usually brass) involving loss of zinc and a surface residue or

deposit of one or more active components (usually copper).

dichromate treatment—A chemical treatment for magnesium alloys in a boiling sodium dichromate solution, resulting in a surface film that resists corrosion.

die casting—Pouring metals into final shapes in metal molds, usually alloys that have relatively low melting points, such as zinc, lead, tin, aluminum—or magnesium-base alloys. If the metal is forced into the mold, the process is called "pressure die casting," otherwise, "gravity or permanent mold die casting."

differential heating—A heating process by which the temperature is varied within the object so that, after cooling, various parts may have different properties as desired.

diffusion—Movement of atoms within a solution. The net movement is usually in the direction from regions of high concentration towards regions of low concentration in order to achieve homogeneity of the solution, which may be a liquid, solid or gas.

dilatometer—An instrument for measuring expansion or contraction caused in a metal by changes in temperature or structure.

dispersion (deflocculation)—Separation or scattering of fine particles in a liquid medium; usually used in connection with the fineness test of clay.

distribution (sand)—Variation or uniformity in particle sizes.

dowel—A pin of various types used on joint between sections of parted patterns or core boxes to assure correct registry.

draft, pattern—Taper on vertical elements in a pattern which allows easy withdrawal of pattern from a sand mold.

drag—Lower or bottom section of a mold or pattern.

drawback—Section of a mold lifted away on a plate or arbor to facilitate removal of the pattern.

draw bar—A bar used for lifting the pattern from the sand of the mold.

draw peg—A wooden peg used for drawing patterns.

drawing—Removing pattern from mold.

draw plate—A plate attached to a pattern to facilitate drawing of pattern from sand.

drop—A defect in a casting due to a portion of the sand dropping from the cope or other overhanging section.

drop core—A type of core used in forming comparatively small openings occurring above or below the parting; the seat portion is so shaped that the core is easily dropped into place.

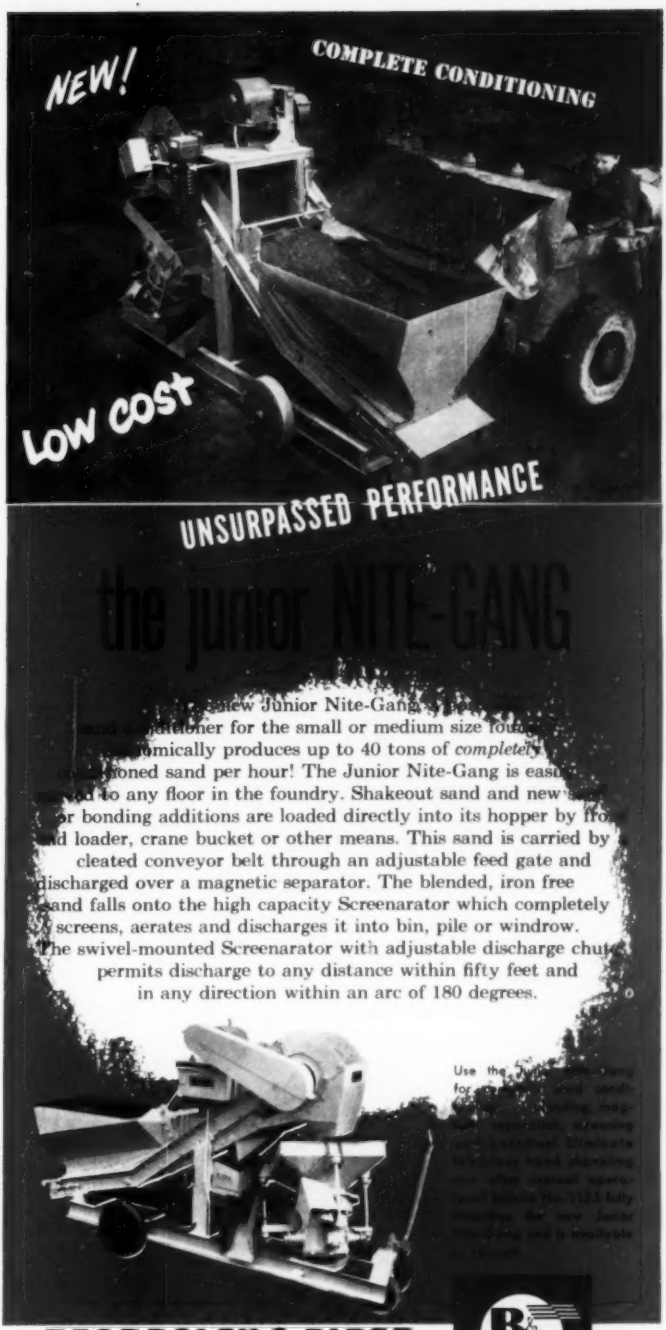
dross—Metal oxides in or on molten metal.

dry fineness—The fineness of a sample of foundry sand, from which the clay has not been removed, and which has been dried at 221 to 230 F (105 to 110 C).

dry permeability—The property of a molded mass of sand dried at 221 to 230 F (105 to 110 C) and cooled to room temperature to pass through it gases resulting during pouring of molten metal into a mold.

dry sand mold—A mold which has been baked before being filled with liquid metal.

(Continued on Next Page)


NEW!
COMPLETE CONDITIONING
Low cost
UNSURPASSED PERFORMANCE
the junior NITE-GANG
The new Junior Nite-Gang is the
sand conditioner for the small or medium size foundry.
Economically produces up to 40 tons of completely
conditioned sand per hour! The Junior Nite-Gang is easily
moved to any floor in the foundry. Shakeout sand and new
or bonding additions are loaded directly into its hopper by front
end loader, crane bucket or other means. This sand is carried by
cleated conveyor belt through an adjustable feed gate and
discharged over a magnetic separator. The blended, iron free
sand falls onto the high capacity Screenarator which completely
screens, aerates and discharges it into bin, pile or windrow.
The swivel-mounted Screenarator with adjustable discharge chute
permits discharge to any distance within fifty feet and
in any direction within an arc of 180 degrees.
Use the
for
BEARDSLEY & PIPER
DIVISION OF PETTIBONE MULLIKEN CORPORATION
2424 North Cicero Avenue, Chicago 39, Illinois
B&P
Manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmullor • Mulbaro • Screenarator • Nite-Gang • Junior Nite-Gang • Preparator • B&P Combination Sand Conditioning and Mulling Units • B&P Champion Speed-Draw • B&P Plate Feeders • B&P Turntables • B&P Gyratary Screens
FEMA

Reduce Rejects NOW!

WITH

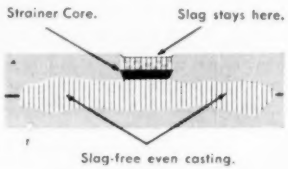
ALSIMAG®

STRAINER CORES

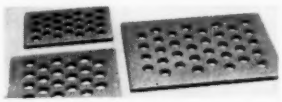
ALSIMAG STRAINER CORES (skimmer cores) are flat, hard, precision-made ceramic strainers that fit into the gate of the mold. They strain the molten metal and at the same time make it flow smoothly into the mold. The result is a slag-free evenly poured casting.

ALSIMAG STRAINER CORES—show little abrasion from the metal stream—give positive even flow of metal—have even thermal expansion—withstand all normal pouring temperatures—are easier and quicker to use because they will take rough handling—start saving you money the day you begin to use them.

Rejects in one foundry were cut 35% upon the installation of AlSiMag Strainer Cores. Another foundry, after long experience, states, "In all cases a definite improvement was noted if the molding procedure included the use of AlSiMag Strainer Cores."



Do you know about AlSiMag Cut-off Cores? Sometimes called Feeder Cores, these perforated flat ceramic pieces fit into gate of mold, are made in any size and with any number and size of holes. Inquire today.



FREE SAMPLES ON REQUEST. Test AlSiMag Cores in your own foundry. Sample cores from sizes in stock will be sent free on request. Test samples made to your own specifications at reasonable cost.

These cores come packed in
HANDY STURDY CARTONS, READY FOR IMMEDIATE USE BY THE MOLDER

AMERICAN LAVA CORPORATION

CHATTANOOGA 5, TENNESSEE

49TH YEAR OF CERAMIC LEADERSHIP

OFFICES: Philadelphia • St. Louis • Cambridge, Massachusetts • Chicago
Los Angeles • Newark, N. J.

GLOSSARY

(Continued from Preceding Page)

dry strength, dry bond strength—Tenacity (compressive, shear tensile or transverse) of a sand mixture which has been dried at 221 to 230 F (105 to 110 C) and cooled to room temperature.

ductility—The property permitting permanent deformation in a material by stress in tension without rupture.

durability (sand)—Rate of deterioration of a sand in use due to dehydration of its contained clay.

E

elastic limit—The greatest stress which a material can withstand without permanent deformation.

elongation—Amount of permanent extension in the vicinity of the fracture in the tensile test; usually expressed as a percentage of original gage length, as 25 per cent in 2 in.

endurance limit—A limiting stress, below which the metal will withstand, without rupture, an indefinitely large number of cycles of stress.

endurance ratio—Ratio of endurance limit for cycles of reversed flexural stress to the tensile strength of the material.

erosion scab—A casting defect occurring where the metal has been agitated, boiled, or has partially eroded away the sand, leaving a solid mass of sand and metal at that particular spot.

etching—In metallography, the process of revealing structural details by preferential attack of reagents on a metal surface.

eutectic—(1) Isothermal reversible reaction of a liquid that forms two different solid phases (in a binary alloy system) during cooling. (2) The alloy composition that freezes at constant temperature, undergoing the eutectic reaction completely. (3) The alloy structure of two (or more) solid phases formed from the liquid eutectically.

eutectic alloy—In any alloy system, the composition at which two descending liquidus curves in a binary system or three descending liquidus surfaces in a ternary system meet at a point. Thus such an alloy has a lower melting point than neighboring compositions. More than one eutectic composition may occur in a given alloy system.

eutectic melting—Melting of local micro areas that are the same as the eutectic in average composition. On cooling rapidly, these areas solidify into a typical eutectic structure.

eutectoid reaction—Isothermal reversible reaction of a solid that forms two new solid phases (in a binary alloy system) during cooling. As with *eutectic*, the word *eutectoid* can also refer to an alloy composition or structure associated with the reaction.

eutectoid steel—A steel of eutectoid composition. This composition in pure iron-carbon alloys is 0.80 per cent C, but variations from this composition are found in commercial (impure) steels, and particularly in alloy steels, in which the carbon content of the eutectoid usually is lower.

expansion (sand)—The dilation which a sand undergoes when heated.

expansion scabs—Rough thin layers of metal partially separated from the body of the casting by a thin layer of sand, and held in place by a thin vein of metal.

F

facing, facing material—Coating material applied to the surface of a mold to protect the sand from the heat of the molten metal. See MOLD WASH.

facing sand—Specially prepared molding sand used in the mold adjacent to the pattern to produce a smooth casting surface.

false cheek—A cheek used in making a three-part mold in a two-part flask.

false chuck—Sometimes applied to the facing material used in rechucking an object.

false cope—Temporary cope used only in forming the parting and therefore not a part of the finished mold.

fatigue—Tendency for a metal to break under conditions of repeated cyclic stressing considerably below the ultimate tensile strength.

fatigue crack or failure—A fracture starting from a nucleus where there is an abnormal concentration of cyclic stress and propagating through the metal. The surface is smooth and frequently shows concentric (sea shell) markings with a nucleus as a center.

fatigue limit—Maximum stress that a metal will withstand without failure for a specified large number of cycles of stress. Usually synonymous with *endurance limit*.

feeder, feeder head—A reservoir of molten metal to make up for the contraction of metal as it solidifies. Molten metal flowing from the feed head, also known as a *riser*, prevents voids in the casting.

feeding—Pouring additional molten metal into a freshly poured mold to compensate for volume shrinkage while the casting is setting.

ferrite—Solid solution in which alpha iron is the solvent, and which is characterized by a body-centered cubic crystal structure.

ferroalloys—Alloys of iron and some other element or elements (carbon excepted) when such an alloy is to be used as a raw material in manufacture of ferrous metals.

ferroboron—An alloy of iron and boron containing about 10 per cent boron.

ferrochromium—An alloy of iron and chromium available in several grades containing from 66 to 72 per cent chromium and from 0.06 to 7 per cent carbon.

ferromanganese—Iron-manganese alloys containing more than 30 per cent manganese.

ferromolybdenum—An alloy of iron and molybdenum containing 58 to 64 per cent molybdenum.

ferrophosphorus—Alloy of iron and phosphorus used for the addition of phosphorus to steel.

ferrosilicon—Alloy of iron and silicon used for adding silicon in the manufacture of steel.

ferrotitanium—an alloy of iron and titanium available in several grades containing from 17 to 38 per cent titanium.

ferrous—Term refers to alloys in which the predominant metal or solvent is iron.

ferrovanadium—An alloy of iron and vanadium containing 35 to 40 per cent vanadium.

fillet—Concave corner piece used at the intersection of surfaces. A struck fillet is one that is dressed to shape in place. A planted fillet is one made separately and affixed in place.

fin—A thin projection of metal from the casting.

fineness (sand)—The extent of subdivision of a foundry sand, as determined by the A.F.S. fineness test.

fines—In a molding sand, those sand grain sizes substantially smaller than the predominating grain size; also, material remaining on 200 and 270 mesh sieves and pan in testing for grain size and distribution.

fine silt—Sand particles less than 20 microns in diameter (0.02 mm or 0.0008 in.). This is included in A.F.S. clay and by itself has very little plasticity or stickiness when wet.

finish allowance—Amount of stock left on the surface of a casting for machine finish.

finish mark—A symbol in the form of an *f* appearing on the line of a drawing that represents the edge of the surface of the casting to be machine finished.

firebrick—Brick made from highly refractory clays for use in lining furnaces.

fireclay—A clay with a high fusion temperature having a P.C.E. of not less than cone 19 (1520 C, 2768 F). Clays with a P.C.E. from 19 to 26 inclusive are called "low heat-duty fireclays" and fireclays with a P.C.E. of cone 27 or higher are designated as "refractory."

firestone—A type of refractory rock (mica schist) used for lining cupolas and other types of furnaces.

flame annealing—Process of softening a metal by application of heat from a high-temperature flame.

flame hardening—Process of hardening a ferrous alloy by heating it above the transformation range by means of a high-temperature flame and then cooling as required.

flange—A stiffening member or the means of attachment to another object.

flask—Metal or wood box without top and without fixed bottom used to hold the sand in which a mold is formed; usually consists of two parts, cope and drag.

flask pins—Pins to assure proper alignment of the cope and drag of the mold after the pattern is withdrawn.

flask, snap or slip—Same as *tight flask*, but equipped with device permitting easy removal when mold is made.

flask, tight—A metal or wood box without top and without fixed bottom, used to hold the sand in which a mold is formed; usually consists of two parts, cope and drag. Remains on mold during pouring.

flowability—The property of a foundry sand mixture which enables it to fill pattern recesses and move in any direction against pattern surfaces under pressure.

(Continued on Next Page)

Prove by use-test what hundreds of foundries know . . . that you get better cores at lower cost, and cleaner, more uniform castings, with Dayton Core Oil. Order a drum for a use-test. Ask our representative to help you solve your core production problems.

THE DAYTON OIL COMPANY

DAYTON, OHIO

Makers of DOCO BINDER & CORE PASTE • DOCO STEEL CORE & MOLD WASH

Paddock
BALL-BEARING
BAND SAW GUIDES

CUT COST of SAW-BLADE REPLACEMENT

★

SPEED UP PRODUCTION

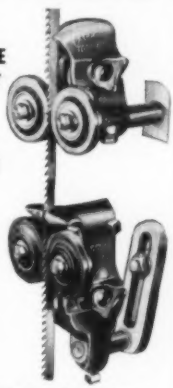
★

CUT MORE MATERIALS

★

PROTECT WORKMEN

★



Install Paddock Ball-Bearing Band Saw Guides!

Interchangeable Ball-Bearing Wheels running with the blade give strong friction-free support. Will last years. Easy to install. Makes any band-saw work better. Pays for itself by reducing blade breakage.

Write for circular and prices

PADDOCK TOOL CO.

1418 Walnut St. Kansas City 6, Mo.

GUIDE MAKERS SINCE 1920

Do You Know?

This match plate solved a nuisance job . . . SAVED 400%

TAMASTONE

THE PERFECT PATTERN COMPOUND

Write! Learn how Tamastone can save in your plant

Tamms Industries, Inc.

228 N. La Salle St., Chicago 1, Ill.

Foundry Sand Testing HANDBOOK

A foundryman may select his scrap with the greatest of care. His melting procedure may check with the most advanced practice. And he may exercise full control over his methods. BUT . . . he cannot consistently produce sandcastings in molds prepared from uncontrolled sand mixtures.

A casting is only as good as the mold . . . that's why the A.F.S. FOUNDRY SAND TESTING HANDBOOK is a "must" for the foundryman's library. Order your copy today: $2.25 to A.F.S. Members; $4.00 List Price.

AMERICAN FOUNDRYMEN'S SOCIETY

616 S. Michigan
Chicago 5

GLOSSARY

(Continued from Preceding Page)

fluidity—Ability of molten metal to flow readily as measured by the length of a standard spiral casting.

fluorspar—Commercial grade of calcium fluoride.

flux—Basic material added to the cupola charges to unite with sand, ash, and dirt during the melting, to form a slag.

fluxing—Applying a solid or gaseous material to molten metal in order to remove oxide dross and other foreign materials. The treatment of molten magnesium alloys with flux is frequently called refining.

fly ash—A finely divided product of combustion, which may appear as inclusions in metal melted in the open hearth type of furnace.

follow board—A board which conforms to the form of the pattern and defines the parting surface of the drag.

forehearth—Brick-lined reservoir in front of the cupola.

founding—The art of melting and casting of metals into useful objects to serve the needs of man and industry.

foundry—A building, establishment, or works where metal founding is carried on.

foundryman—Craftsman employed in the production of metal castings.

foundry facing—Material, usually carbonaceous, applied to the surface of a sand mold to prevent the molten metal from penetrating and reacting with the sand.

fusion—A casting surface defect having a rough glassy appearance due to sand fused to the surface of the casting.

fusion point (of refractories)—Temperature at which the particular specimen under a definite stress becomes sufficiently fluid to flow at a specified rate.

G

gaggers—Metal pieces of irregular shape used to reinforce and support sand in deep pockets of molds.

gaging—Checking dimensional requirements by means of a gage.

galvanizing embrittlement—Brittleness caused by cooling malleable iron quickly from a temperature of 800 to 900 F.

gamma iron—The form of iron stable between 1670 and 2550 F. (910 and 1400 C) and characterized by a face-centered cubic crystal structure.

ganister—A highly siliceous sandstone used as a refractory, particularly for furnace linings.

gas holes—Rounded cavities, either spherical, flattened, or elongated, in a casting, caused by the generation and/or accumulation of gas or entrapped air.

gate—End of the runner where metal enters the casting; sometimes applied to entire assembly of connected channels, to the pattern parts which form them or to the metal which fills them, and sometimes is restricted to mean the first or main channel.

gated patterns—One or more patterns with gates or channels attached.

germination—Abnormal grain growth in which, under certain conditions, a few grains may grow at the expense of neighboring grains.

grain fineness number (A.F.S.)—Approximately the number of mesh per inch of that sieve which would just pass the sample if its grains were of a uniform size, that is, the average of the sizes of grains in the sample. It is approximately proportional to the surface area per unit weight of sand, exclusive of clay.

grain (sand)—The granular material of molding or core sand, left after removing the clay substance in accordance with the A.F.S. fineness test.

grains—Individual crystals in metals.

grain refiner—Any material added to a liquid metal for producing a finer grain size in the subsequent casting.

graphite—Native carbon in hexagonal crystals, also foliated or granular massive, of black color with metallic luster and soft. Used for crucibles, foundry facings, lubricant, etc. Also made artificially by passing alternating current through a mixture of petroleum coke and coal tar pitch.

graphitic embrittlement—Reduction in ductility of a metal or alloy, associated with the occurrence of graphite in the grain boundaries.

graphitizing—A heating and cooling process by which the combined carbon in cast iron or steel is transformed, wholly or partly, to graphitic or free carbon. See TEMPER CARBON.

gravel—When used in connection with foundry practice the granular material resulting from the natural or artificial disintegration of rock and characterized by an appreciable proportion of particles that would pass a sieve with ¼-in. opening and remain on a No. 6 sieve. A gravel may contain considerable quantities of coarser and finer particles.

gravity segregation—Variable composition caused in a casting by the settling of the heavier constituents.

gray cast iron—Cast iron which contains a relatively large percentage of its carbon in the form of graphite, and substantially all of the remainder of the carbon in the form of eutectoid carbide. Such material has a gray fracture.

green permeability—The property of a molded mass of sand in its tempered condition which is a measure of its ability to pass gases through it.

green sand—Molding sand tempered with water.

green sand core—Body of sand usually formed directly from a pattern in making the mold.

green sand mold—A mold composed of prepared molding sand in the moist, or "as mixed" condition.

green strength—Tenacity (compressive, shear, tensile or transverse) of a tempered sand mixture.

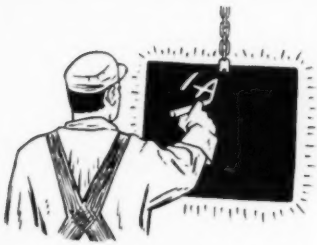
grinding—Removing gates and fins from castings by means of an abrasive grinding wheel.

H

halloysite—A massive, claylike or earthy material used as a bond in certain types of green sand molding. It is isotropic, has a conchoidal fracture and often resembles unglazed porcelain.

hardenability—In a ferrous alloy, the property that determines the depth and dis-

KORN'S
METAL MARKING CRAYONS



FOR MARKING
ALL TYPES
HOT, COLD, WET OR DRY
METALS
WILL NOT RUB OFF
WATERPROOF

Samples and Price List
on request

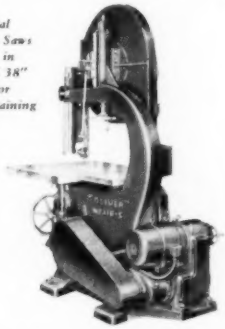
WM. KORN, INC.
260 West St., New York, N. Y.

"OLIVER"
36-inch Metal Cutting
BAND SAW

Cuts sprues, risers, gates, heavy and light sections of metals, sheet metals, compositions and wood

A powerful, sturdy Band Saw — the finest built. Cuts true, steady and smooth. Extra large capacity under guide. Has low speed geared head direct connected to lower wheel for cutting heavy cross sections. Also furnished with high speed motor for sawing woods, composition, sheet metals. Quick change rim and tire. Write for Bulletin 116-S.

"Oliver" Metal Cutting Band Saws also available in 18", 30" and 38" sizes. Write for bulletins containing full details.



OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN

tribution of hardness induced by quenching.

hardness (sand)—Resistance offered by a sand mixture to small area deformation.

head—An opening in the sand above and connected with the mold; also the pressure exerted by a fluid as a head of stream or of molten metal.

heap sand—Green sand from the foundry floor.

hearth—In a reverberatory furnace, the portion that holds the molten metal or bath.

Editor's Note: Part III of the A.F.S. Glossary of Foundry Terms will appear in the September issue.

LETTERS

(Continued from Page 53)

given task or assignment has been "well done," and this expression certainly applies to all those connected with making the 54th Annual Convention of A.F.S. the huge success it was.

E. J. McAfee
Master Patternmaker
Puget Sound Naval Shipyard

Glossary, Bibliography Fill Need

Let me commend American Foundryman for two very desirable articles in the July issue. The first is the *Glossary* which was started and which I hope will be carried right through. (Second section starts page 54 this issue.) From the standpoint of the universities this is a highly useful addition to the present foundry literature.

Other article is Prof. F. R. Morral's bibliography on nodular iron which will certainly find considerable use in industry as well as in education.

You probably know I have been critical of our literature because of its lack of organized casting design material. I hope you are contemplating other bibliographies in the future and that you will consider one covering design literature of the past few years.

George K. Dreher
Executive Director
Foundry Educational Foundation

Keeps Record Straight

Under the heading of *"Old Timers of the Foundry Industry Attend 54th Convention"* (American Foundryman, July 1950, page 46) my name appears in the 50-year roster along with the indication that I've been in the industry for 53 years. It should read 63; in fact I am going on my 64th year. I had charge of the core department for many years, and also had charge of one of our foundries for several years. As a result of my good behavior I have been promoted to the Personnel Office and am still going strong, celebrating my 78th birthday today (July 20).

Henry M. Oehling
Nat'l. Malleable & Steel Cstgs. Co.
Cleveland

Controlled
PERMEABILITY
of Foundry Sand?

Yes! . . . with this Gordon & Campbell PERMTESTER

All the advantages of controlled permeability in foundry sands are available with the PERMTESTER—simple, dependable, and convenient to use. Recommended for routine foundry production control and for laboratory investigation of new material and procedure.

Write for full particulars.

OTHER Gordon & Campbell TESTING EQUIPMENT:

Core Hardness Tester Direct reading gives accurate hardness test in a few seconds.
Combination Rammer - Compression Tester Simple way to prepare specimens to determine compression strength.
Transverse Test Core Maker For preparing core specimens for transverse tests.
Transverse Core Tester Rapidly determines transverse strength of dry sand cores.
Baking Oven Electrically heated, dries sand samples, bakes core specimens.
Moisture Tester A reliable method of measuring moisture content.
Sand Mixer For thorough preparation of sample core-sand mixtures.
Sand Washer The easy-to-use method to determine clay content of sand.

Each of these testing units was designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

Complete information upon request

GORDON SERVICE

CLAUD S. GORDON CO.
Manufacturers & Distributors
Metallurgical Testing Machines • Industrial Furnaces & Ovens • Temperature Control Instruments • Thermocouples & Accessories
Dept. 18 • 3000 South Wallace St., Chicago 16, Ill.
Dept. 18 • 2035 Hamilton Ave., Cleveland 14, Ohio

You get it... with a Cleveland Air Vibrator. Whether it's gentle persuasion your foundry equipment needs, or powerful, hammer-like blows, there's a Cleveland Air Vibrator that will keep production at peak efficiency at minimum cost.

TYPE "SA"

Our portable lightweight – Type *SA* Vibrator is designed to remove matchplate patterns from sand molds and other foundry applications. Equipped with swivel connections to save hose... won't kink or buckle.

More rugged and powerful Cleveland Air Vibrators are Types *C* and *F* and Type LSH Hook Type Shakeout Vibrator, which are used on all molding and core machines. Mounting bases are milled parallel to fit any molding machine. Readily adaptable to screens, chutes, bail-type shakeout units, benches and hopper installations.

TYPE "C"

TYPE "F"

TYPE "LSH"

Cleveland Air Vibrators are long in wear and low in cost. Catalog No. 105, giving more detailed foundry applications is available on request.

THE CLEVELAND VIBRATOR COMPANY

2787 Clinton Ave. • Cleveland 13, Ohio

CHAPTER ACTIVITIES

(Continued from Page 71)

ucational Committee, reported that the chapter has given complete foundry technical libraries to Vanderbilt University, the University of Tennessee, and the University of Chattanooga, and that a foundry school would start in the fall at Kirkman Vocational School, Chattanooga. Graduates from this school will be given preferential treatment in securing jobs in the foundries of this section, he said.

Mr. Landgrebe suggested that any excess in the treasury over four years' operating expenses be used for purchase of scholarships for boys at a foundry trade school.

Porter Warner, Jr., Chairman of the Membership Committee, reported a total membership of 134.

After receiving reports of committees for the past year, Mr. Landgrebe held election of officers for the new year. The officers elected by acclamation were:

Chairman—Paul Arnold, U. S. Pipe & Foundry Co.; *vice-chairman*, Porter Warner, Jr., Porter Warner Industries; *Secretary & Treasurer*, Herman Bohr, Jr., Robbins & Bohr; *Directors, (Terms Expire 1951)*; Karl Landgrebe, The Wheland Co.; William Delaney, Eureka Foundry; Charles Saunders, Tennessee Products; D. B. Shannon, Somerville Iron Works. *Directors (Terms Expire 1952)*: Sam Northington, Combustion Engineering Corp.; Lester Bealer, American Brake Shoe Co.; *Directors (Terms Expire 1953)*: W. P. Willson, Athens Plow Co.; W. M. Hamilton, Crane Co.

After the election, the retiring chairman, Karl Landgrebe, turned the gavel over to Paul Arnold, the new chairman.

Mr. Warner introduced the speaker of the evening, E. C. Jeter, Ford Motor Co., Dearborn, Mich. His subject was *"Metallurgy and Production of Gray Iron Casting"*.

Mr. Jeter said the subject was too broad a one to cover in one session and that no individual had the required knowledge to do so, but that he would try to discuss some of the relationship between metallurgy and the sciences of materials in the production of gray iron castings.

Foundrymen in the past did not have such metallurgical knowledge as is now

Notables at the Western New York Chapter Picnic, June 24, included, left to right: Chapter Chairman Alfred A. Diebold; A.F.S. National Director Martin J. O'Brien, Jr., Thomas B. Barone, Congressman Anthony F. Tauriello, and Reinhold D. Loesch. (photo courtesy Marve Taublieb, Frederic B. Stevens, Inc., Publicity Chairman)

Chapter Directors taking office at Eastern New York Chapter's Annual Meeting, June 20, included, left to right: Lee Martin, Northern Indiana Brass Co. of New York, Glens Falls; R. N. Williams, Geo. F. Pettinos, Inc., Granville, N. Y.; Scott Mackay, Rensselaer Polytechnic Institute.

Happy foundrymen at Western New York Chapter's Annual Picnic, June 24.

used in foundry, the speaker said—casting was then an art and the tricks of the trade were handed down from father to son and from old timers to apprentices.

Most of the gray iron made prior to the advent of the automobile was for stove plates, heavy machinery, and agricultural castings. Here, metallurgy wasn't considered as important as it is today, the speaker said. Tensile strength and absence of porosity inside were not required to the same degree that they are today, he added.

Mr. Jeter said the advent of the internal combustion engine and all that went with it made the gray iron industry aware of science. This did not take place overnight, but was a slow painful process. Foundrymen found that backscrap made a better casting than just plain pig, and steel scrap in cupola mixes made better castings.

Men who had the training and time began to find out why certain things did this or that to castings, the speaker said. The foundry industry was becoming a science of correct melting, mixing and blending of materials, a science that makes gray iron castings the highly dependable and useful products they are today. Mr. Jeter then had slides shown—first a picture of the Ford Plant, where 2,500 tons of gray iron and 400 tons of steel are being poured daily into automotive castings. To accomplish this, 2,000 tons of sand, 62,500 lb of cereal bond, 65,000 lb of dry binder, and 3,300 gallons of core oil are used. In addition, for the melting department, 900 tons of pig iron, 600 tons of scrap steel, 200 tons of cast iron scrap, 100 tons of limestone and 300 tons of coke are used.

Mr. Jeter said these materials must be of known properties and used in correct proportions to make a desired product. The foundryman, he said, has had the most exacting task required in any industry—to secure the right materials and then use them in such a manner as to get maximum benefit from them.

Mr. Jeter said that a good example of a high quality gray iron casting is a cylinder block. Scientific knowledge of the properties of core materials, core and mold washes go into its makeup the speaker said.

Mr. Jeter said the Ford motor block is produced by utilizing metal from both blast furnaces and cupolas. No other foundry has such a system—nor do they need one, he said. However, since the Ford foundry is located adjacent to blast furnaces, Ford management has seen fit to utilize blast furnace metal directly. The cupola melts 60 per cent cast iron scrap and the balance [illegible] scrap, but no pig iron. This will come out about 3 per cent carbon and 3 per cent silicon, the speaker said, and this metal is poured into a 400-ton hot metal holder or mixer, and the remaining 40 per cent, which is blast furnace metal, is also charged into the mixer.

The blast furnace metal charged into the mixer has an analysis of about 4 per cent carbon and 1.25 silicon. This, mixed with the cupola metal, gives a resultant analysis of 3.40 carbon and 2.20 silicon for the cylinder block casting.

Mr. Jeter said that it is his opinion that carbon content is important in all automotive castings. Running carbons lower than 3.30 and building up silicon too fast won't make castings of as high a quality as are obtained by 3.40 carbon and lower silicon.

Ford Motor Co. was bothered with fins in cylinder block waterjackets at a point between the shallow and deep jacket cores, and it was next to impossible to seal these joints with core paste. A method of pasting all the cores together before coating with core wash was then developed, the speaker said.

Besides cracks in cylinder blocks, another difficulty was dirty sidewalls that leaked on air tests. These were found to be caused by core wash. By changing the type of wash from a partially oil and resin-bonded wash to one with 100 per cent organic binder, this was corrected, Mr. Jeter concluded.

HIGH SILICON IRON

JISCO

T. M. Reg.

SILVERY

A

BLAST FURNACE

PRODUCT

Metallurgically PURE

Physically Clean

and Uniform

The choice of foundrymen who demand the best

THE JACKSON IRON & STEEL CO.

JACKSON OHIO

SCIENTIFIC MATCH PLATES

Pressure Cast

1. The finest quality Matchplates ever produced in our history!
2. Fast delivery of ordinary plates in from 4 to 6 days!
3. At prices only *slightly* higher than 12 years ago!

The SCIENTIFIC CAST PRODUCTS Corp

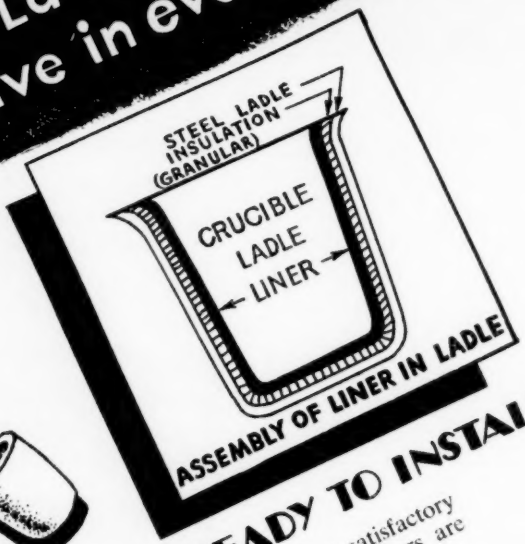
1388-1392 EAST 40th STREET

CLEVELAND 3, OHIO

2520 WEST LAKE STREET

CHICAGO 12, ILLINOIS

CRUCIBLE Ladle Liners Save in every foundry



PREFORMED, READY TO INSTALL

Made of the same materials as those satisfactory Crucibles you are using, these Ladle Liners are time and money savers in the foundry. On the outside, the steel shell; then the granular insulation; finally the Crucible Liner. These Liners, preformed, eliminate the labor of lining ladles; they maintain the high quality of metal; self-cleaning-metal and slag do not stick. Their use will increase efficiency in your foundry. Crucible Liners are available in a range of sizes to fit all standard steel shells. Ask your Crucible salesman.

Write for Crucible Melters Handbook; mailed free.

Index to Advertisers

Ajax Metal Div., H. Kramer & Co. 4
American Lava Corp. 88
Archer-Daniels-Midland Co. Werner G. Smith Co., Div., The . . . Inside Back Cover
Baroid Sales Div., National Lead Co. 81
Beardsley & Piper Co. 87
Black, Sivalls & Bryson, Inc. . 17
Cleveland Flux Co. 11
Cleveland Vibrator Co., The . 92
Corn Products Sales Co. . . . 16
Crucible Manufacturers' Assn. 94
Dayton Oil Co. 89
Delta Oil Products Co. 14
Detroit Electric Furnace Div., Kuhlman Electric Co. . . 19
Dietert, Harry W., Co. 86
Eastman Kodak Co. 73
Electro Metallurgical Div., Union Carbide & Carbon Corp. 6
Federal Foundry Supply Co., The 1
Federated Metals Div., American Smelting & Refining Co. 9
Gordon, Claud S., Co. 91
Industrial Equipment Co. . . . 85
International Nickel Co. . . . 84
Jackson Iron & Steel Co. . . . 93
Keokuk Electro-Metals Co. . . 76
Korn, Wm., Inc. 91
Krause, Chas. A., Milling Co. . 13
Lindberg Engineering Co., Fisher Furnace Div. . . . 10
Mathieson Chemical Corp. . . 2
Miller Motor Co. 83
Modern Equipment Co. Back Cover
National Engineering Co. . . . 20
Ohio Ferro-Alloys Corp. . . . 12
Oliver Machinery Co. 91
Paddock Tool Co. 89
Pittsburgh Lectromelt Furnace Corp. . . . Inside Front Cover
Schmieg Industries, Inc. . . . 15
Schneible, Claude B., Co. . . . 75
Scientific Cast Products Corp. . 93
Semet-Solvay Div., Allied Chemical & Dye Corp. . . 85
Stevens, Frederic B., Inc. . . . 5
Tamms Industries 90
Tennessee Products & Chemical Corp. 18
Union Carbide & Carbon Corp., Electro Metallurgical Div. . 6
U. S. Graphite Co. 7
U. S. Hoffman Machinery Corp. 80
Wheland Co., The 80

A.F.S. Publications

GENERAL BOOK LISTING . . . 79
FOUNDRY CORE PRACTICE . . 96
RECOMMENDED PRACTICES FOR SAND CASTING NON-FERROUS ALLOYS 79

A. F. S. Employment Service

To contact "Help Wanted" or "Position Wanted" advertisers, write to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, designating item number and issue of AMERICAN FOUNDRYMAN in which advertisement is published.

In replying to "Help Wanted" advertisements, please furnish resumé of experience, education and other pertinent qualifications.

HELP WANTED

HW531—Core Room Foreman: Large Southern gray iron foundry desires experienced man capable of supervising production and assembly of small to medium sized cores on highly repetitive work. Must be able to teach and coordinate making of cores on benches and blow machines. In replying please state age, experience, and salary expected.

HW532—Pattern Shop Supervisor: Capable of supervising design, rigging, and maintenance of metal pattern and core box equipment in large Southern production gray iron foundry. Please give references and full details of experience.

HW533—Basic Electric Melter: An experienced basic electric melter is needed by a Central Ohio steel foundry. Position not permanent but for purpose of establishing basic practice and training furnace personnel. Melting of carbon and low alloy steels will be involved. Salary detail given on application.

HW535—Time Study & Methods Engineer: With steel foundry experience, wanted for permanent position in vicinity of Cleveland, Ohio. Good opportunity with well established company. Write stating experience, qualifications, and expected salary to start.

HW536—Sand Plant Manager: Want man with foundry experience to operate and manage sand plant located in Middle West.

HW537—Sales Engineer: National organization is seeking services of experienced, well-qualified sales engineer, between 35 and 40 years of age, who has a thorough knowledge of foundries and foundry practice, preferably one who has had extensive contacts with foundries in the Midwest. Salary will be commensurate with ability. All replies held in strict confidence.

HW539—Permanent Mold Superintendent: Man capable of running permanent and semi-permanent mold shop from estimate through finished casting. Must be able to design molds. Metropolitan New Jersey area. State all qualifications in reply.

HW540—Cleaning Room Foreman: Gray iron production foundry in Northeastern Ohio area is looking for a man to take complete charge of all phases of modern cleaning and finishing department processing 80 tons of finished castings per day. Give qualifications, references, salary expected, and other pertinent data.

HW541—Core Room Foreman: Medium size Middle West gray iron foundry specializing in cylinder heads, blocks, and manifolds. Fine opportunity for man able to take complete charge of core room. We are a growing organization and can reward ability to produce with further advancement.

HW542—Research Metallurgist: Experience in melting and casting of metals desired. Familiarity with ferrous and non-ferrous alloys required. Experience in following important: vacuum melting and casting, melting and casting of titanium, gases dissolved in molten metals, and effect of vibration on solidification. Opportunity to do publishable research in well-equipped laboratory. Minimum education B.S. from well-rated university; doctor's degree desirable. High-grade experience may be substituted for advanced degree. Minimum working experience four years progressive professional scientific employment including at least one year important and responsible work. Civil Service position.

POSITIONS WANTED

PW144—Maintenance Engineer: Available after July 1. Will locate anywhere. Wide experience, 21 years, in foundry maintenance—mechanical electrical, and preventive. Age 40; married.

PW145—Metallurgical Engineer: Have B.S. in metallurgy. 16 years' experience in aluminum die casting and permanent mold work, including plant control and process development problems, trouble shooting, customer service, operating supervision, and personnel training. Permanent mold estimating and design experience. General knowledge sand practice. Age 39. Prefer Eastern or Northwest location.

PW146—Foundry Metallurgist: Graduate engineer desires responsible position in foundry production and metallurgical control work. 8 years' experience in development of cast iron, steel, and high temperature alloy castings of all sizes. Experience in working on all types of production problems and applying new ideas in the foundry.

PW147—Manufacturer's Agent: Want quality casting lines on commission basis for state of Michigan. Have metallurgical and foundry production experience.

PW148—Metallurgical Engineer: Two years foundry research with large corporation. B.S. in metallurgical engineering. Desire position with progressive foundry on East Coast. Age 25. Complete details of qualifications on request.

FOR SALE
SOIL PIPE FOUNDRY

Fully mechanized. Good location. Steady production. Unfilled orders for entire capacity. Priced to sell.

EDWARD H. ZOLL
790 Broad St. Newark, N. J.

American 89/70 Model "M" Sandcutter

A real opportunity to obtain at a substantial saving a Model "M" Sandcutter in excellent condition. Only four years old, it will provide many years of rugged service in unexcelled low-cost sand conditioning. Ready to go to work on your foundry sand immediately.

Zenith Foundry Company
1501 S. 83rd St. West Allis 14, Wis.

ENGINEERS — EXECUTIVES
MANAGERS — TECHNICAL MEN

Salaried Positions—$3600 to $30,000. This confidential service for men who desire a new connection will develop and conduct preliminary negotiations without risk to present position. Send name and address for details.

TOMSETT ASSOCIATES
1207-4 Berger Bldg. Pittsburgh 19, Pa.

Professional Cards

Harold J. Roast
F.I.M., F.C.S., M.E.I.C.
BRONZE FOUNDRY CONSULTANT
15 Church Hill, Westmont 6, Que., Canada
Available Coast to Coast

Lester B. Knight & Associates, Inc.
Consulting Engineers
Management • Sales • Production • Surveys
Modernization • Mechanization
600 West Jackson Blvd., Chicago 6, Ill.
30 Church St., New York 7, N. Y.

CASADONTE RESEARCH LABORATORIES
Chemists, Metallurgists, and
Foundry Consultants
Complete Testing Facilities
2410 Lake Ave. N. Muskegon, Mich.

EARL E. WOODLIFF
FOUNDRY SAND ENGINEER
Consulting • • Testing
14611 Fenkell (5-Mile Rd.) Detroit 27, Mich.
Res. Phone Vermont 5-8724

INDUSTRIAL ELECTRONICS, INC.
William T. Bean, Jr., Director
"GOOD CASTING DESIGN—ON PURPOSE!"
CONSULTATION
STRESS ANALYSIS • INSTRUMENTATION
8060 Wheeler St. Detroit 10, Mich.

NOW AVAILABLE
THESE NEW SERVICES FOR READERS AND ADVERTISERS

- **Classified Advertising** — Rate $10 per column inch
- **Employment Service** (Position and Help Wanted) — Rates $5 and $10
- **Professional Card Advertising** for Engineers and Consultants — Rate $10 per column inch

American Foundryman
616 S. Michigan Ave. Chicago 5

Foundry CORE Practice

A Revision of "MODERN CORE PRACTICE AND THEORIES"

. . . dealing exclusively with the production and use of cores in the modern foundry

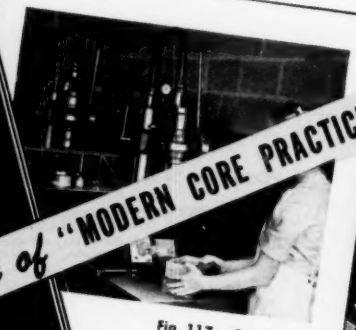


Fig. 117—Bench-type Core Blowing Machine

Fig. 190—High-frequency Dielectric Core Baking Oven

Written in practical, understandable language for operating men and metallurgists, FOUNDRY CORE PRACTICE covers the entire cycle of core-making operations . . . from materials and mining methods to final setting of cores and molds.

A complete 560-page handbook, containing 314 photographs, graphs, and sketches, 81 tables and an extensive bibliography, the text covers:

- INTRODUCTION
- CORE SANDS—TYPES AND LOCATIONS
- CORE BINDING MATERIALS
- CORE MIXTURES
- STORAGE AND CONDITIONING OF CORE MATERIALS
- MIXING EQUIPMENT, OPERATIONS, DISTRIBUTION AND STORAGE
- CORE MAKING METHODS AND EQUIPMENT
- FACTORS AFFECTING CORE BAKING
- CORE OVENS AND THEIR CONTROL
- CORE FINISHING OPERATIONS
- CORE COATINGS
- CORE HANDLING
- PROCEDURES FOR DETERMINING THE PROPERTIES OF CORES AND CORE MIXTURES
- CONTROLLING CORE PROPERTIES
- CORE SETTING
- CORE KNOCK-OUT
- CORE SAND RECLAMATION
- CASTING SURFACES AS AFFECTED BY CORE-SAND MIXTURES
- ECONOMICS OF CORE PRODUCTION
- DEFECTS CAUSED BY FAULTY CORES

Over 100 leading authorities on foundry problems collaborated with the author, Harry W. Dietert, an international authority on sand problems, to pool their knowledge to make FOUNDRY CORE PRACTICE the type of book that will be of maximum benefit to the foundry field . . . available now to AFS members for $6.50; list price $10.00.

ORDER YOUR COPY TODAY

MEMBER PRICE . . . $ 6.50
LIST PRICE 10.00

American Foundrymen's Society

616 South Michigan Avenue, Chicago 5, Illinois

Postage paid by AFS when remittance accompanies order.

Please send me promptly ..... copies of "Foundry Core Practice" by **H. W. DIETERT.**

Date_____

I enclose $_____ Cash ☐ Money Order ☐ Check ☐ to cover:

Please send invoice ☐

Name_____

Company_____

Address_____

City_____ P.O. Zone____ State_____

A Core is The Key To A Good Boiler Section

THE H. B. SMITH COMPANY, INC. • • • WESTFIELD, MASS.

A cast iron boiler section is basically a hollow metal shell, completely enclosing a core that forms the interior of the section. It's the performance of this core that pretty much determines how good the finished casting will be.

For example. After machining, each boiler section is pressure-tested. Now if the section core hadn't completely dried, or if it gave off an excess of gas during pouring, the inside of the casting would be pitted with pinholes—leaks would develop during testing.

On the other hand, suppose the outside of the core had over-baked. Hot metal, hitting soft and crumbly edges, would chew away pieces of core. The inside of the casting then becomes irregular, rather than smooth, and the free flow of water would be impeded.

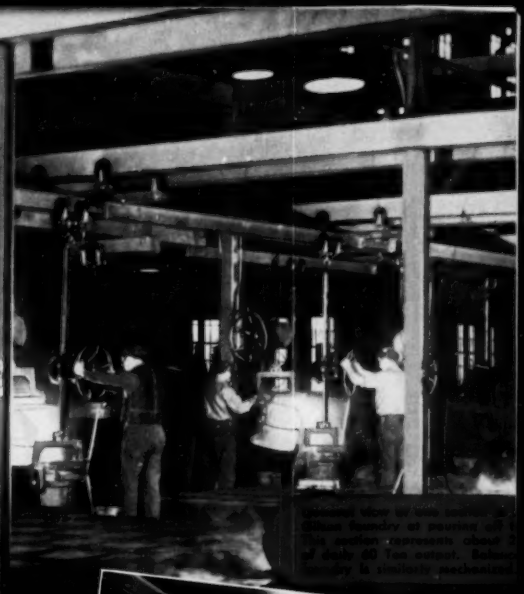
So you see that the core is a mighty important part of a boiler section casting. The H. B. Smith Company accepts only the best of workmanship and materials in their cores. And their core oil? LINOIL, of course; it's been their core oil for over thirty years.

LINOIL
THE LOGICAL OIL

ARCHER-DANIELS-MIDLAND COMPANY

(THE WERNER G. SMITH COMPANY DIV.)

2191 WEST 110th STREET · CLEVELAND 2, OHIO



60 Tons Per Day The MODERN Way

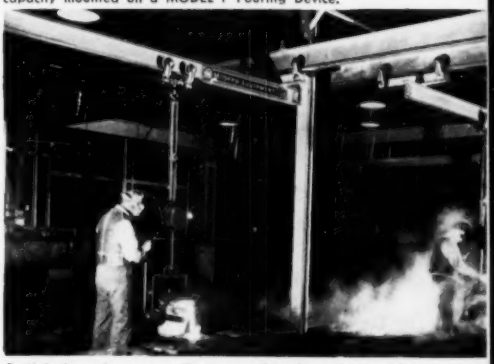
Light snap-flask molds being poured with a 13" MODERN Tapered Covered Ladle of about 200 lbs. capacity mounted on a MODEL F Pouring Device.

...thru Efficient Mechanized Distribution and Pouring of Molten Metal

The pictures on this page were taken in a foundry mechanized for high production pouring by the installation of properly engineered MODERN EQUIPMENT. Superstructures, runways, cranes, hangers, pouring devices, pouring ladles and distributing ladles . . . all bear the MODERN Trade Mark.

The MODERN EQUIPMENT CO. offers foundrymen the benefit of its long and varied experience in the engineering and production of equipment for complete mechanization of metal pouring and distributing operations.

Ask Your MODERN Representative or Write for Illustrated Bulletins



Partial view of squeezer floor operation shown in top picture. Molders pour their own molds with MODERN Ladles and Pouring Devices suspended from MODERN Cranes and Runways. The result is higher mold production.

MODERN EQUIPMENT CO.

PORT WASHINGTON, WISCONSIN

CUPOLAS • CUPOLA CHARGERS • LADLES OF ALL TYPES • POURING DEVICES • METAL POURING SYSTEMS • CRANE AND MONORAIL SYSTEMS • ELECTRIC CRANES.

AMS-1PC-1